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# *EVALUATION OF THE DISCRETE VORTEX WAKE CROSS FLOW MODEL USING VECTOR COMPUTERS*

## *Part II — Users Manual for DIVORCE*

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**TRW**  
DEFENSE AND SPACE SYSTEMS GROUP



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## INTRODUCTION

Volume 1 of this two part report presents the theoretical development of the discrete vortex wake cross flow method for predicting forces on bodies of revolution at high angle of attack. Results for several missile test cases are also presented in Volume 1. This volume of the report is the users manual for the Discrete VORtex Cross flow Evaluator (DIVORCE) computer program. DIVORCE was developed in FORTRAN IV for the CDC 6600 and CDC 7600 machines. Optimal calls to a NASA vector subroutine package are provided for use with the CDC 7600.

## 1.0 PROBLEM DESCRIPTION

The Discrete VORtex Cross flow Evaluator Program (DIVORCE) is used to predict the aerodynamic force and moment coefficients on bodies of revolution at high angles of attack.

The time development of the flow behind an impulsively started circular cylinder whose radius is changing in time is computed using a large number of discrete point vortices to describe the wake region. The point vortices are introduced into the wake from boundary layer and rear shear layer separation points.

The unsteady integral momentum boundary layer equations are solved to determine boundary layer separation for early times after impulsive start and for times where the cylinder radius is changing. For times later in the solution where the cylinder radius is constant and quasi-steady flow may be assumed Stratford's (1) criterion is used to determine separation. A form of Stratford's criterion is included for turbulent as well as the laminar flow case. The unsteady integral momentum solution is only valid for laminar flow.

The viscous cross flow analogy (Ref. 2) is invoked to relate the two dimensional results to the distribution of normal and side force on the three dimensional body of revolution. The rate of change of the cylinder radius depends on the three dimensional geometry.

The normal and side force distributions are integrated to yield the total normal and side forces, and pitching and yawing moments.

## 2.0 INPUT

### 2.1 CARD INPUT

Except for the case header card, all card input is accomplished via NAMELIST \$ENGAGE. The case header card must be the first card in the input data deck. Up to 60 characters may be input starting in column one. Following this card is the \$ENGAGE card and then all of the input items for this case. The input is terminated by a \$END card.

### 2.2 INPUT DESCRIPTIONS

#### 2.2.1 Body Geometry

DIVORCE is able to operate on any axisymmetric body. A standard ogive cylinder is the nominal body shape and the program input needed to describe it is minimal. Any other body must have radius given as a function of length.

For an ogive cylinder the length and maximum diameter must be entered in dimensional values. The nose length may be entered as a dimensional value or as a number of diameters. If the second option is chosen, the nose length is multiplied by the diameter prior to the calculations. Given these values a table of radius versus length is generated.

For a general body this table of radius versus length must be entered. There are a maximum of 51 values in each table.

Given these tables, tables of time, nondimensionalized length, nondimensionalized radius and its first and second derivatives, and values of the equivalent two dimensional cylinder radius,  $a_k$ , and its first and second derivatives are generated. Some of these parameters are used in the final calculations for the aerodynamic coefficients.

For the standard ogive cylinder, the values of  $a_k$ ,  $\dot{a}_k$ ,  $\ddot{a}_k$  are computed at each time step. For other bodies, these values are found by linear interpolation upon the created tables.

### 2.2.2 Execution Controls

An initial distance along the body length is given at which to start execution. A value of time is found for this distance. A time step is given either as a constant or variable. If DELT is entered it is assumed that this is a constant time step. For a variable time step a minimum and maximum step size are given and DELT will vary between them. DELT must not be entered to use this option. Nominal values for the limits are .05 and .125. The program will continue until one of the following conditions has been fulfilled.

- 1) The number of time steps = KFINAL
- 2) The length along the body  $\geq$  ZFINAL
- 3) The amount of CPU time  $\geq$  TFINAL

### 2.2.3 Restart Capability

It is possible to stop the execution at an intermediate point, check the answers, and continue if desired. If RITEOUT = 1, the common blocks will be written into a file (TAPE5) when one of the three conditions in Section 2.2.2 has occurred. This file may be stored on disk or tape and will be read in at the beginning of the next run. READIN must be set to 1. and the data will be read from a file (TAPE4). The restart capability can be used any number of times, but care must be taken to update the card input data for KFINAL, ZFINAL and/or TFINAL. Most of the input data is not saved and must be reentered on the restart run.

### 2.2.4 Perturbation

For a certain distance along the body it may be desired to perturb the value of the vortex strength parameter, (SIGMA). ZPERT and ZPEND define this segment. SIGMA is perturbed by an amount which is input as a fraction of SIGMA. For example if DELSIG = .1 the change in SIGMA is defined by

$$\Delta\sigma = (-.1)\sigma$$

and

$$\sigma' = \sigma + \Delta\sigma \text{ in the range ZPERT to ZPEND}$$



### 2.2.5 Pressure Calculations

The pressure calculations are done every KPRES time steps. Values of  $C_d$  and  $C_x$  and an array of pressure on the body as a function of the angle around the body are computed. These may be output as files or listings as desired. A time history of  $C_d$  and  $C_x$  is stored for use in the computation of CN, CY,  $C_m$  and  $C_n$  at the end of the run. ZLAMDA is used in the computation of  $C_m$  and  $C_n$  and is nominally zero.

### 2.2.6 Coalescence

It is possible to combine two or more vortices into one if they are sufficiently close together. Nominally no coalescence will occur but if KRCØAL and/or KCØAL are set to positive integers, coalescence will occur every KRCØAL or KCØAL time steps. A value of EPS can be entered (nominally = .1) to use in the determination of the proximity equations. If two vortices satisfy the proximity test they are combined to form one. This will cause differences of some degree in the answer, but will decrease execution time significantly.

### 2.2.7 Vectorization

Both loop code and vector code has been used in the program. At a low number of time step the loop code executes faster than the vector code. But as the number of steps nears 40 the execution is about the same and then the vector code becomes faster. An input parameter (KVEC, nominally = 50) is available which tells the program to shift to the vector code when the number of time steps reaches it. There appears to be a significant round off difference in the vector routines which will cause somewhat different answers.

### 2.2.8 Boundary Layer Separation

Two different solutions to the boundary layer equations are used to determine the separation point. For times less than  $t = 4.0$

the unsteady integral momentum equations are solved for laminar flow. For times greater than  $t=4.0$ , and provided that the cylinder radius is constant Stratford's method is used to determine the boundary layer separation points. Stratford's method may be used for either laminar or turbulent flow. If  $LAM = 0$  the laminar scheme is used. If  $LAM = 1$  Stratford's turbulent equations are used and the transition length (XTR) must be entered.

#### 2.2.9 Print Flags

Various types of printed output exist in the program. The minimal amount of print will normally be used, especially for long runs. Each time step consists of one line of print (see Section 3.0). The vortex information may be printed at every KPRINT steps and the pressure data may be printed every KPRINTP times that the calculations are made. In addition, intermediate information in a number of areas of the program may be printed for use in debugging. Care should be taken in using these print flags because a lot of print can be generated in a very short time.

#### 2.2.10 Plot Flags

It may be desired to output data at specific time steps onto a disk file or tape which may then be run through a plotting program. Three distinct types of output exist and their formats are described in Section 3.2. Briefly they are the vortex information, pressure information and aerodynamic coefficient information.

The vortex information may be written out at every KLØUT time steps or a table of nondimensionalized body length values [ZØTV (100)] may be input. If one method is used the other can not be used. For the second method, the data is written at the first time step past a value in the table. The output will terminate upon encountering a zero in the table.

The pressure information is written out at the first time step for which it is calculated past a value in the table ZØTP(100). Likewise, output will terminate upon hitting a zero in the table.

The aerodynamic coefficients are written on the same file as the pressure terms for any run with KPRES not equal to zero. It is written regardless of the existence of any pressure data.

TABLE 2.1  
\$ENGAGE NAMELIST INPUT

<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>NOMINAL</u>
	* * * FLAGS * * *	
ISYM	Symmetry flag for the pressure calculations. = 0 asymmetric pressure integration = 1 symmetric pressure integration	0.
LAM	Boundary layer separation flow flag = 0 for laminar flow = 1 for turbulent flow	0.
RITEOUT	Restart flag = 0 for no restart = 1 to write restart data on file TAPE5 for use with a continuation run.	0.
READIN	Restart flag = 0 for no restart = 1 to read restart data from file TAPE4 in order to begin execution at last point of a prior run.	0.

<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>NOMINAL</u>
* * * CONSTANTS * * *		
RC	Discrete point vortex core radius	0.05
XTR	Transition length in radians from $\theta = 0.0$ . Used only if LAM =1	0.0
ATTACK	Angle of attack in degrees	0.0
SIGMA	Vortex strength parameter	0.6
DELSIG	Amount to perturb SIGMA in the range ZPERT to ZPEND. Entered as a fraction of SIGMA. DELSIG (comp) = -DELSIG (input) *SIGMA and SIGMA (pert) = SIGMA (input) + DELSIG (comp)	0.1
ZLAMDA	Moment center measured from the nose and nondimensionalized by body length. ( $\lambda = Z^*/\ell$ ).	0.0
EPS	Coalescence radius	0.1
* * * BODY GEOMETRY * * *		
OGIVE	Ogive cylinder flag = 0 for general body shape = 1 for ogive cylinder	1.0
* * OGIVE CYLINDER * *		
ZLENGTH	Total body length	0.0
DEE	Maximum body diameter	0.0
ZLN	Nose length	0.0
ZLND	Nose length as a number of diameters $ZLN = ZLND * DEE$	0.0

<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>NOMINAL</u>
* * GENERAL BODY * *		
ZSTAR (51)	Argument table of body length values. The last value is set to ZLENGTH.	0.
RSTAR (51)	Function table of body radius values. The largest value is used to compute DEE.	0.
* * * TIME STEP CONTROLS * * *		
KFINAL	The number of time steps at which to terminate execution.	512.
KPRES	Pressure calculations are made at every KPRES time steps. If KPRES = 0 no calculations are made.	5.
KVEC	Vector method flag. When the step counter reaches KVEC, the vector routines are invoked.	50.
KCØAL	Coalescence of all vortices occurs every KCØAL time steps.	0.
KRCØAL	Coalescence of rear vortices only occurs every KRCØAL time steps.	0.
* * * TIME CONTROL * * *		
TFINAL	Execution is terminated when the CPU time reaches TFINAL.	500.
DELT	Constant value of delta time for each step.	0.
DELTMIN } DELTMAX }	Limits of delta time as it varies throughout the run. DELT must not be entered to use this option.	.05 .125

<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>NOMINAL</u>
* * * OUTPUT FLAGS * * *		
KPRINT	Vortex information is printed at every KPRINT time steps.	0.
KPRINTP	Pressure values are printed every KPRINTP points, assuming that they have been calculated. That is whenever $M\emptyset D(K, KPRES) = 0$ and $M\emptyset D(K, KPRINTP) = 0$	0.
KLØUT	Vortex information is written onto an output file (TAPE6) at every KLØUT points. If ZØTV is being used this must not be entered.	0.
ZØTV (100)	Array of nondimensionalized body length values at which to write vortex information on the output file (TAPE 6). The data at a point immediately after a value of ZØTV is written.	0.
ZØTP (100)	Array of nondimensionalized body length values at which to write the pressure values around the body on an output file (TAPE7). The first point at which the pressure values have been calculated past a value of ZØTP is written.	0.
* * * BODY LENGTH CONTROLS * * *		
ZFINAL	Nondimensionalized value of the length on the body at which to terminate execution.	1.
ZINIT	Nondimensionalized value of the length on the body at which to initialize execution.	0.
ZPERT ZPEND}	Nondimensionalized values along the body which define the beginning and end of the perturbations on SIGMA.	0. 0.

<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>NOMINAL</u>
* * * DEBUG PRINT FLAGS * * *		
PRV	Nonzero to print rear vortex separation information.	0.
PBL	Nonzero to print steady boundary layer separation information.	0.
PAP	Nonzero to print unsteady boundary layer separation information.	0.
PCØAL	Nonzero to print coalescence information.	0.
PFIX	Nonzero to print vortex motion corrections and pressure calculation corrections.	0.



### 3.0 OUTPUT

#### 3.1 PRINTED OUTPUT

##### 3.1.1 Nominal

For each execution of the program, the following items are written to the print file. Page one contains all the NAMELIST input parameters and their values for the case except for the arrays ZØTP, ZØTV, RSTAR and ZSTAR and the body geometry data, which appears on page two. Listed therein are the input values and the calculated values. The definitions of these values are given in Table 3-1.

Following the input and geometry information the program lists one line for each time step. These values are defined in Table 3-2. The last page contains a summary of the aerodynamic coefficients and the separation angles. These values are defined in Table 3-3. The tabular values are stored at each pressure calculation step and the scalars are computed at the end of the run. The local normal force coefficient and local side force coefficients are obtained from the two dimensional drag and lift values in Table 3-2 by the factor shown below.

$$C_d = CDPK \cdot \sin^2 \alpha (2AW)/DEE$$

Samples of the print format for these pages are given in Figures 3-1, 3-2, 3-3 and 3-4.

##### 3.1.2 Vortex Information

At each KPRINT time point the information for all of the vortices is printed. The front top and bottom vortices are printed first followed by the rear top and bottom vortices. The parameters are described in Table 3-4 and the format shown in Figure 3-5.

##### 3.1.3 Pressure Information

The pressure information and drag and lift coefficients are computed every KPRES times. These values are printed whenever

$M\emptyset D(K, KPRINTP) = 0$  and  $M\emptyset D(K, KPRES) = 0$ . The parameters are defined in Table 3-5 and the format given in Figure 3-6.

#### 3.1.4 Coalescence Information

Whenever the vortices are coalesced, information concerning this function can be printed out. The vortex information is printed both before and after the coalescence and a list of the actions taken is given. The longer of the two tables is always listed on the left side. The sets of vortices are referred to by the following numbers

- 1 - Front top
- 2 - Front bottom
- 3 - Rear top
- 4 - Rear bottom

Table 3-6 and Figure 3-7 define and describe this information.

#### 3.1.5 Debug Information

Information concerning the rear vortex separation, the unsteady boundary layer separation, quasi-steady boundary layer separation, and some fixup information can be printed on user option. Care should be exercised so that a ridiculous amount of print is not generated. The parameters printed in these sections of the program can be traced through the subroutine listings.

### 3.2 DATA FILE OUTPUT

#### 3.2.1 Vortex Information

The vortex information is written onto a data file either at every  $KL\emptyset UT$  time points or at a specified value of body length given in table  $Z\emptyset TV$ . This data is written on TAPE6 and has the following format:

One logical record consisting of N words where

$$N = 4 + 4K\emptyset \cdot 6$$
$$K\emptyset = \text{MAXO}(KT, KB, KRT, KRB)$$
$$KT = \text{number of top vortices}$$
$$KB = \text{number of bottom vortices}$$
$$KRT = \text{number of top rear vortices}$$
$$KRB = \text{number of bottom rear vortices}$$

The data is the time step number (K), the time (T), the length along the body (Z) and KØ followed by KØ sets of a counter (I), x and y position, x and y velocity and vortex strength gamma for each of the four types of vortices.

The FØRTRAN write statement used is:

```
WRITE (6) K, T, Z, KØ, (I,(X(I,J), Y(I,J), XDØT(I,J),  
YDØT(I,J), GAMMA (I,J), J = 1, 4), I = 1, KØ)
```

### 3.2.2 Pressure Information

At the first point at which the pressure information is calculated past a value in ZOTP, the equivalent three dimensional pressure as a function of angle around the body is written on a file (TAPE7). Each logical record contains 126 words which are the number of words to follow (NITS = 125), the step number (K), time (T), the length along the body (Z) and 61 pairs of body angle (PHI) and pressure (PRES).

The FØRTRAN write statement is:

```
WRITE (7) NITS, K, T, Z, (PHI(I), PRES(I), I = 1, 61)
```

At the end of the run a dummy record of the same length but with K set to zero is written. This is used to signify that the next record contains the drag and lift coefficient data.

### 3.2.3 Drag and Lift Data

If any pressure information was calculated the last record on file TAPE7 will contain the drag and lift coefficients as functions of body length. This record will appear even if no output was generated in Section 3.2.2. The logical record is of length N where  $N = 3 \cdot NPC + 1$  where NPC = number of times the pressure calculations were made.

The record consists of the number of words to follow ( $NITS = 3 \cdot NPC$ ) plus NPC sets of body length, drag coefficient and lift coefficient.

The FØRTRAN write statement is:

```
WRITE (7) NITS, (ZZ(I), CSD(I), CSL(I), I = 1, NPC)
```

TABLE 3-1  
BODY GEOMETRY DATA

<u>SYMBOL</u>	<u>DESCRIPTION</u>
LENGTH	Overall body length as input as ZLENGTH ( $\emptyset$ GIVE = 1) or as extracted from table ZSTAR ( $\emptyset$ GIVE = 0.), $\ell$
DIAMETER	Maximum body diameter as input as DEE ( $\emptyset$ GIVE = 1) or as extracted from table RSTAR ( $\emptyset$ GIVE = 0.), $d$
AREA	Frontal area, $S = \pi d^2/4$
F	Fineness ratio, $\ell/d$
AW	Characteristic body radius. $AW = DEE/2$ . for $\emptyset$ GIVE = 1. For non-maximum diameter ended bodies, ie., ellipsoids, boatails, etc., AW is computed as the average of the body radius, $\tilde{a}$
ZSTAR	Table of lengths along the body. For $\emptyset$ GIVE = 1, the value of ZLENGTH is divided by 50 to obtain the values in this table. For $\emptyset$ GIVE = 0 this table is input.
RSTAR	Table of radius values along the body. For $\emptyset$ GIVE = 1 these are computed. For $\emptyset$ GIVE = 0. this table is input.
Z	Nondimensionalized values of body length, $Z^*/\ell$
T	Values of time corresponding to the length along the body, $t = Ut^*/\tilde{a}$
RZR $\emptyset$	Nondimensionalized values of body radius, $R = 2R^*/d$
DRZR $\emptyset$	First derivative of radius with respect to length.
DDRZR $\emptyset$	Second derivative of radius with respect to length.
A	Circular cylinder radius at time (T), $a(t) = \frac{d}{2\tilde{a}} R(Z)$ For $\emptyset$ GIVE = 1, $A = RZR\emptyset$
AD $\emptyset$ T	First derivative of A with respect to time.
ADD $\emptyset$ T	Second derivative of A with respect to time.

TABLE 3-2  
CIRCULAR CYLINDER TIME DEPENDENT RESULTS

<u>SYMBOL</u>	<u>DESCRIPTION</u>
K	Number of current time step.
TIME	Time, $t = \frac{Ut^*}{\bar{a}}$
Z	Nondimensionalized value of body length, $Z = Z^*/\ell$
THETAS	Top separation angle in degrees.
THETASB	Bottom separation angle in degrees.
THTASR	Top rear separation angle in degrees.
THTASRB	Bottom rear separation angle in degrees.
CDPK	Drag coefficient.
CLPK	Lift coefficient.
AK	Cylinder radius A at time step K.
AKDØT	First derivative of A at time step K.
AKDDT	Second derivative of A at time step K.

TABLE 3.3  
AERODYNAMIC COEFFICIENTS

<u>SYMBOL</u>	<u>DESCRIPTION</u>
Z	Nondimensionalized body length, $Z^*/\ell$
CD	Local normal force coefficient, $\frac{2\tilde{a}}{d} \sin^2 \alpha \text{ CDPK} = C_d$
CL	Local side force coefficient, $\frac{2\tilde{d}}{d} \sin^2 \alpha \text{ CLPK} = C_\ell$
THETAS	Top separation angle in degrees
THETASB	Bottom separation angle in degrees
CN	Normal force coefficient, $N/q_\infty S$
CY	Side force coefficient, $Y/q_\infty S$
CSM	Pitch moment, $M/q_\infty S\ell$
CSN	Yaw moment, $MY/q_\infty S\ell$

TABLE 3-4  
VORTEX INFORMATION

<u>SYMBOL</u>	<u>DESCRIPTION</u>
N	Point vortex number, $x_n, y_n, t_n$
K	Current time step counter.
$\begin{Bmatrix} X \\ Y \end{Bmatrix}$	Top vortex position.
$\begin{Bmatrix} X\dot{\theta}T \\ Y\dot{\theta}T \end{Bmatrix}$	Top vortex velocity.
$\begin{Bmatrix} X\ddot{\theta}T \\ Y\ddot{\theta}T \end{Bmatrix}$	Top vortex acceleration.
GAMMA	Top vortex strength.
"B" suffix	Designates bottom vortex data.
"RT" suffix	Designates rear top vortex data.
"RB" suffix	Designates rear bottom vortex data.

TABLE 3-5  
PRESSURE INFORMATION

<u>SYMBOL</u>	<u>DESCRIPTION</u>
T	Time.
Z	Distance along the body.
AK	Cylinder radius at timestep K.
AKDOT	Derivative of cylinder radius at timestep K.
THETAS	Separation angle.
DEG	Angle around the body.
PHIVT	Component of the potential term in the Bernoulli equation due to point vortices, $\phi^V_{,t}$
PHIPT	Component of the potential term in the Bernoulli equation due to changing radius, $\phi^P_{,t}$
2(PHIT)	Time derivative of the potential term in the Bernoulli equation, $2(\phi^V_{,t} + \phi^P_{,t})$
-PSKSQD	Negative of the square of the surface velocity.
CPK	Two dimensional circular cylinder coefficient of pressure at timestep K, $(2\phi_{,t} + 1 - u_o^2)$
CP3D	Three dimensional surface pressure, $(2\tilde{a}/d)*\sin^2\alpha*CPK$
UTAN	Surface velocity, $u_o$



TABLE 3-6  
COALESCENCE INFORMATION

<u>SYMBOL</u>	<u>DESCRIPTION</u>
N	Vortex number, $x_n$ , $y_n$ , $\Gamma_n$
$\left. \begin{array}{l} X \\ Y \\ \text{GAMMA} \end{array} \right\}$	Position and strength of vortex of first set of data.
"B" suffix	Designates second set of data.
$\left. \begin{array}{l} I1 \\ I2 \end{array} \right\}$	Locations of vortices being combined.
$\left. \begin{array}{l} \text{LIST1} \\ \text{LIST2} \end{array} \right\}$	Identification of type of vortices being combined.

DOCUMENT SAMPLE CASE									
KFINAL	KPRES	KVEC	KCOAL	KRCOAL	KLOUT	KPRINT	KPRINTP	ISYM	LAM
40	5	30	0	0	0	0	0	0	0
R <sub>L</sub> ADIN	RITEOUT	PRV	PBL	PAP	PFIX	PCOAL	LGIVE		
0.	0.	0.	0.	0.	0.	0.	1.		
TFINAL	DELT	DELTMIN	DELTMAX	ZFINAL	ZINIT	ZPERT	ZPEND	RC	XTR
500.000	0.000	.050	.125	1.000	.010	.050	.250	.050	0.000
AATAACK	SIGMA	DEL SIG	7LAMDA	EPS					
30.000	.600	.100	0.000	.100					

FIGURE 3-1 NAMELIST INPUT PARAMETERS

## DOCUMENT SAMPLE CASE

## BODY GEOMETRY

	LENGTH		DIAMETER		AREA		F		AW
	78.2720		7.6000		45.3646		10.2769		3.8000
ZSTAR	ESTAR	7	I	RZRO	DRZRO	DDRZRO	A	ADUT	ADOUT
J.0000	.0000	0.0000	0.0000	.0000	8.2333	-37.8531	.0000	.6423	-.2677
1.0054	.1973	.0000	.2378	.1572	7.4400	-35.5125	.1572	.6248	-.2552
3.1509	1.1371	.0000	.4757	.2948	6.7716	-35.3567	.2948	.5694	-.2500
4.0963	1.6272	.0000	.7135	.4282	6.0749	-34.3460	.4282	.5108	-.2429
5.2618	2.0530	.0000	.9514	.5429	5.3959	-33.4807	.5429	.4538	-.2367
7.6272	2.4479	.1000	1.1692	.6442	4.7346	-32.7406	.6442	.3981	-.2315
9.3426	2.7830	.1200	1.4271	.7324	4.0865	-32.1138	.7324	.3436	-.2271
10.9591	3.0673	.1400	1.6849	.8077	3.4496	-31.5909	.8077	.2901	-.2234
12.5235	3.3075	.1600	1.9028	.8704	2.8222	-31.1644	.8704	.2373	-.2204
14.0696	3.4915	.1800	2.1406	.9207	2.2024	-30.8262	.9207	.1852	-.2180
15.6044	3.6425	.2000	2.3754	.9586	1.5885	-30.5777	.9586	.1336	-.2162
17.2198	3.7400	.2200	2.5163	.9842	.9788	-30.4697	.9842	.0823	-.2150
18.7853	3.7913	.2400	2.6541	.9977	.3716	-30.3217	.9977	.0312	-.2144
20.3507	3.8000	.2500	2.6920	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
21.9162	3.8000	.2900	2.3298	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
23.4816	3.8000	.3000	2.5577	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
25.0470	3.8000	.3200	2.6055	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
26.6125	3.8000	.3400	4.0433	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
28.1779	3.8000	.3600	4.2912	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
29.7434	3.8000	.3800	4.5190	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
31.3088	3.8000	.4000	4.7569	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
32.8742	3.8000	.4200	4.9947	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
34.4397	3.8000	.4400	5.2326	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
36.0051	3.8000	.4600	5.4704	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
37.5706	3.8000	.4800	5.7083	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
39.1360	3.8000	.5000	5.9461	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000

FIGURE 3-2 BODY GEOMETRY INFORMATION

40.7014	3.9000	.5200	6.1639	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
42.2559	3.8000	.5400	6.4216	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
43.8323	3.8000	.5600	6.6596	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
45.3478	3.8000	.5800	6.8975	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
46.9632	3.8000	.6000	7.1353	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
48.5286	3.8000	.6200	7.3732	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
50.0941	3.8000	.6400	7.6110	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
51.6595	3.8000	.6600	7.8489	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
53.2250	3.8000	.6800	8.0867	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
54.7904	3.8000	.7000	8.3245	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
56.3558	3.8000	.7200	8.5624	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
57.9213	3.8000	.7400	8.8002	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
59.4867	3.8000	.7600	9.0381	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
61.0522	3.8000	.7800	9.2759	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
62.6176	3.8000	.8000	9.5138	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
64.1830	3.8000	.8200	9.7516	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
65.7485	3.8000	.8400	9.9894	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
67.3139	3.8000	.8600	10.2273	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
68.8794	3.8000	.8800	10.4651	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
70.4448	3.8000	.9000	10.7030	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
72.0102	3.8000	.9200	10.9408	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
73.5757	3.8000	.9400	11.1787	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
75.1411	3.8000	.9600	11.4165	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
76.7066	3.8000	.9800	11.6544	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
78.2720	3.8000	1.0000	11.8922	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000

FIGURE 3-2 CONTINUED

ORIGINAL PAGE IS  
OF POOR QUALITY

DOCUMENT SAMPLE CASE

K	TIME	Z	T4TAS	T4TASB	T4TASR	THTASR8	CUPK	CLPK	AK	AKOUT	AKOUT
1	.114	.010000	189.009	-189.000	J.000	0.000	0.000000	0.000000	.000452	.660795	-.262748
2	.169	.014204	147.392	-149.394	0.000	0.000	0.000000	0.000000	.113164	.647707	-.260756
3	.219	.018409	117.417	-117.417	0.000	0.000	0.000000	0.000000	.145225	.634715	-.258092
4	.269	.022613	114.720	-114.720	0.000	0.000	0.000000	0.000000	.176638	.621817	-.257035
5	.319	.026813	112.261	-112.261	0.000	0.000	.824950	-.000000	.207408	.609011	-.255243
6	.369	.031022	111.530	-111.530	0.000	0.000	.824950	-.000000	.237540	.596242	-.253504
7	.419	.035227	110.786	-110.786	0.000	0.000	.824950	-.000000	.267039	.583659	-.251816
8	.469	.039431	110.147	-110.147	0.000	0.000	.824950	-.000000	.295907	.571110	-.250180
9	.519	.043635	107.259	-109.259	0.000	0.000	.824950	-.000000	.324151	.558641	-.248592
10	.569	.047840	103.596	-103.586	0.000	0.000	1.234126	-.000000	.351773	.546250	-.247052
11	.619	.052044	103.123	-103.123	102.119	-162.119	1.234126	-.000000	.378777	.533935	-.245559
12	.669	.056249	107.445	-107.445	102.204	-162.204	1.234126	-.000000	.405167	.521693	-.244112
13	.720	.060508	105.967	-107.967	162.267	-162.254	1.234126	-.000000	.431277	.509366	-.242591
14	.773	.065041	106.453	-106.453	164.235	-164.176	1.234126	-.000000	.456384	.496322	-.241227
15	.831	.069859	106.209	-106.442	164.304	-164.233	1.234126	-.000000	.480428	.482544	-.239725
16	.892	.074972	106.993	-106.256	164.400	-164.292	1.234126	-.000000	.504280	.469315	-.238191
17	.956	.080394	105.577	-105.960	157.250	-157.195	1.234126	-.000000	.528722	.452722	-.236530
18	1.024	.086117	105.193	-105.634	164.621	-164.503	1.234126	-.000000	.552723	.435056	-.235049
19	1.096	.092163	104.769	-105.267	154.276	-154.125	1.234126	-.000000	.575273	.41812	-.233457
20	1.172	.098534	104.467	-104.910	162.954	-162.752	1.234126	-.000000	.600666	.401812	-.231861
21	1.251	.105232	104.135	-104.852	163.073	-162.805	1.234126	-.000000	.627202	.382702	-.230272
22	1.335	.112254	103.713	-103.886	163.442	-163.525	1.234126	-.000000	.654770	.364607	-.228699
23	1.422	.119514	103.261	-103.607	159.815	-159.636	1.234126	-.000000	.682790	.346671	-.227152
24	1.514	.127275	102.807	-102.913	153.839	-159.858	1.234126	-.000000	.711330	.323990	-.225643
25	1.609	.135513	101.783	-102.573	150.369	-159.947	1.234126	-.000000	.740790	.302587	-.224183
26	1.708	.143513	101.807	-102.537	142.556	-156.201	1.234126	-.000000	.770143	.280467	-.222783
27	1.810	.152732	99.633	-101.637	147.042	-152.607	1.234126	-.000000	.800554	.257722	-.221454
28	1.916	.161141	98.732	-100.771	157.056	-160.480	1.234126	-.000000	.831818	.234327	-.220208
29	2.026	.169323	94.937	-100.527	160.982	-160.380	1.234126	-.000000	.864296	.210344	-.219056
30	2.138	.17761	91.452	-100.714	160.973	-160.400	1.234126	-.000000	.897812	.185816	-.217806
31	2.253	.186433	99.237	-100.259	157.039	-160.504	1.234126	-.000000	.932459	.160799	-.216584
32	2.376	.195314	96.132	-97.657	161.772	-157.207	1.234126	-.000000	.967458	.135340	-.215340
33	2.490	.205378	95.575	-98.057	161.547	-162.337	1.234126	-.000000	.972108	.109499	-.214584
34	2.611	.21596	97.027	-98.262	156.233	-156.161	1.234126	-.000000	.983824	.083337	-.213842
35	2.734	.226937	97.413	-98.465	155.730	-156.123	.865121	.181671	.992447	.056918	-.213045
36	2.859	.240368	95.993	-98.117	160.254	-156.151	.865121	.181671	.997857	.030307	-.212436
37	2.983	.256657	94.219	-97.397	162.914	-162.345	.865121	.181671	.999970	.003572	-.211829
38	3.108	.261359	93.144	-96.749	157.601	-162.683	.865121	.181671	1.000000	0.000000	0.000000
39	3.233	.271879	92.745	-96.339	166.593	-158.647	.865121	.181671	1.000000	0.000000	0.000000
40	3.358	.282390	92.294	-95.967	160.652	-167.360	.552244	-.010532	1.000000	0.000000	0.000000

FIGURE 3-3 TIME STEP OUTPUT INFORMATION

QUALITY

Z	CD	CL	THE TAS	THE TASB
.026818	.200238	0.000000	112.260719	-112.200719
.047840	.300531	0.000000	108.586482	-108.586482
.069859	.381502	.003236	106.207493	-106.441760
.098534	.420100	.012845	104.467467	-105.015890
.135297	.439962	.020436	101.783390	-102.573305
.179761	.370613	.020557	98.656706	-100.718952
.229937	.210280	.045418	97.437531	-98.464543
.282390	.130061	-.002645	92.283964	-93.966950
CN	CY	CSM	CSN	
1.085350	.050474	-.157943	-.011062	

FIGURE 3-4 AERODYNAMIC COEFFICIENTS

N	K	X	Y	XDOT	YDOT	XDDOT	YDDOT	GAMMA	XB	YB	XDJTB	YDJB	XDDTB	YDDTB	GAMHAB
1	20	-.530	.088	-.335	.568	.725	2.753	.016	-.629	-.095	-.321	-.611	.819	-2.941	-.016
2	20	-.649	.232	-.381	.457	.361	-.626	.047	-.649	-.236	-.428	-.435	-.188	1.048	-.047
3	20	-.619	.259	-.257	.440	.298	-.304	.050	-.620	-.263	-.280	-.356	.336	1.447	-.050
4	20	-.673	.131	-.237	.396	-.343	2.080	.051	-.673	-.136	-.242	-.414	-.429	-2.116	-.051
5	20	-.703	.129	-.225	.186	.373	1.782	.052	-.702	-.134	-.230	-.213	.294	-1.944	-.052
6	20	-.734	.131	-.205	-.033	1.230	1.623	.052	-.733	-.136	-.196	-.008	1.320	-2.156	-.052
7	20	-.784	.179	-.478	-.481	3.659	-1.747	.052	-.774	-.174	-.467	.417	2.159	-.440	-.052
8	20	-.751	.222	-.775	-.207	-.327	.732	.052	-.750	-.235	-.736	.256	1.305	1.437	-.052
9	20	-.721	.254	-.623	-.293	1.462	-.350	.052	-.721	-.266	-.752	.253	.933	1.134	-.052
10	20	-.666	.312	-.917	-.140	-.346	-1.664	.053	-.739	-.296	-.924	.279	.359	.686	-.047
11	20	-.694	.330	-.915	-.245	-.059	-.544	.053	-.645	-.345	-.813	.100	-.190	.923	-.047
12	20	-.603	.369	-.708	-.005	.743	-.745	.053	-.611	-.355	-.697	.025	.530	.146	-.048
13	20	-.586	.385	-.744	-.016	-.268	2.450	.057	-.587	-.383	-.760	-.001	-.212	-2.487	-.051
14	20	-.567	.427	-.909	-.211	2.200	-1.092	.061	-.560	-.421	-.790	.254	2.296	.965	-.055
15	20	-.521	.462	-.970	-.124	1.162	.574	.065	-.522	-.456	-.957	.129	1.229	-.724	-.058
16	20	-.467	.501	-1.051	-.166	1.983	.361	-.040	-.469	-.496	-1.041	.186	2.032	-.455	-.061
17	20	-.398	.544	-1.195	-.198	5.779	1.077	.073	-.400	-.540	-1.192	.226	5.615	-.861	-.065
18	20	-.292	.596	-1.393	-.169	6.190	-1.665	.078	-.295	-.592	-1.611	.297	3.101	3.171	-.069
19	20	-.163	.630	-1.858	-.050	-24.526	-.656	.082	-.168	-.627	-1.840	.065	-24.292	.863	-.073

N	K	XRT	YRT	XROOT	YROOT	XRODT	YRODT	GMAKT	XRB	YRB	XRJOTB	YRJOTB	XRODTB	YRODTB	GMAKTB
1	20	-.555	.301	-.235	.390	.557	.519	-.001	-.558	-.296	-.223	-.405	.947	-1.131	.001
2	20	-.556	.299	-.232	.394	.530	.422	-.002	-.558	-.294	-.218	-.411	.941	-1.106	.002
3	20	-.558	.296	-.227	.401	.506	.294	-.002	-.560	-.292	-.214	-.418	.909	-1.035	.002
4	20	-.570	.294	-.247	.440	.423	.075	-.005	-.572	-.293	-.246	-.457	.783	-.826	.005
5	20	-.582	.295	-.307	.462	.123	-.221	-.007	-.565	-.294	-.195	-.355	2.108	1.078	.007
6	20	-.588	.253	-.271	.421	.293	-.299	-.003	-.588	-.255	-.284	-.382	.187	.561	.003
7	20	-.567	.294	-.237	.429	.452	.089	-.002	-.569	-.292	-.232	-.450	.815	-.857	.002
8	20	-.602	.213	-.221	.588	.737	.440	-.002	-.601	-.215	-.152	-.751	1.627	-3.089	.002
9	20	-.592	.250	-.275	.439	.250	-.495	-.004	-.591	-.251	-.289	-.405	.104	.912	.004
10	20	-.616	.189	-.193	.681	-2.543	8.990	-.019	-.615	-.191	-.203	-.665	-2.679	-8.777	.013

FIGURE 3-5 VORTEX INFORMATION

PRESSURE DISTRIBUTION							
T = 1.1718		Z = .0295		AK = .6372		AKDOT = .4322	
						THE TAS = 104.47	
DEG	PHIVT	PHIPT	2(PHIVT)	-PSIKSQD	CPK	CP33	UTAN
0.00	.000084	.0000373	1.6000916	-.000098	2.6000610	.652204	.009080
10.00	.000141	.000153	1.584209	-.126093	2.457690	.614424	.350220
20.00	.000153	.000153	1.512033	-.478765	2.033267	.500317	.691929
30.00	.000104	.000104	1.393424	-1.013437	1.379987	.344997	1.006696
40.00	-.000035	.000104	1.232332	-1.666214	.766088	.141522	1.290819
50.00	-.000325	.000104	1.033432	-2.357667	-.324235	-.031059	1.535470
60.00	-.000893	.000104	.802537	-3.003017	-1.200430	-.300108	1.732922
65.00	-.001357	.000104	.677172	-3.282888	-1.005716	-.401429	1.811074
70.00	-.002016	.000104	.546193	-3.522007	-1.975815	-.493954	1.937670
75.00	-.002969	.000104	.410435	-3.712532	-2.302097	-.575524	1.926793
80.00	-.004388	.000104	.275580	-3.847913	-2.577333	-.644333	1.961610
85.00	-.006579	.000104	.127024	-3.923016	-2.795962	-.690991	1.960661
90.00	-.010143	.000000	-.020286	-3.934159	-2.954445	-.738611	1.983472
95.00	-.016400	-.070106	-.173012	-3.879019	-3.052031	-.763008	1.969522
100.00	-.028765	-.139679	-.336836	-3.756334	-3.093219	-.773305	1.938126
105.00	-.058731	-.208187	-.533037	-3.565226	-3.094063	-.774766	1.688181
110.00	-.168676	-.275112	-.887575	-3.303683	-3.191258	-.797815	1.817604
115.00	-.058425	-.339949	-.795735	-2.964821	-2.761557	-.690389	1.721066
120.00	-.495220	-.402187	-1.794013	-2.525980	-3.320794	-.830198	1.589333
125.00	-.192534	-.461370	-1.307006	-1.909872	-2.217678	-.554420	1.381981
130.00	-.678205	-.517041	-2.390492	-.897267	-2.287759	-.571940	.947242
135.00	-.723357	-.568779	-2.584270	-.222562	-1.806851	-.451713	.471786
140.00	-.686782	-.616186	-2.605935	-.049401	-1.055336	-.413034	.222264
145.00	-.649051	-.658904	-2.615911	-.003002	-1.610913	-.404728	-.054784
150.00	-.587420	-.696608	-2.568055	-.039484	-1.607539	-.401885	-.198706
155.00	-.514943	-.729010	-2.487906	-.037421	-1.525327	-.391332	-.193445
160.00	-.415668	-.755864	-2.343063	-.213023	-1.556086	-.389021	-.461544
165.00	-.335717	-.776065	-2.225363	-.370418	-1.595781	-.396345	-.608620
170.00	-.181172	-.792153	-1.946650	-.475113	-1.424763	-.356191	-.091457
175.00	-.162378	-.801312	-1.927331	-.073795	-1.001176	-.250294	-.271652
180.00	-.160927	-.804373	-1.930601	-.000011	-.930612	-.232553	-.003341
185.00	-.157893	-.801312	-1.914412	-.065454	-.983875	-.245968	.255849
190.00	-.162265	-.792153	-1.908037	-.450850	-1.359687	-.339222	.671453
195.00	-.311131	-.776065	-2.176192	-.369236	-1.545420	-.356357	.007646
200.00	-.382424	-.755864	-2.275575	-.177214	-1.453704	-.363447	.420908
205.00	-.461748	-.729010	-2.381515	-.025123	-1.400638	-.351660	.158502
210.00	-.543287	-.696608	-2.479790	-.033596	-1.513380	-.378347	.183293
215.00	-.579256	-.659904	-2.476320	-.000567	-1.476007	-.364222	-.023816

FIGURE 3-6 PRESSURE INFORMATION



220.00	-.621444	-.616186	-2.475259	-.079615	-1.554874	-.388719	-.282161
225.00	-.320536	-.568778	-1.775627	-.633364	-1.611991	-.402998	-.912886
230.00	-.606599	-.517041	-2.247230	-1.643895	-2.291175	-.572794	-1.021712
235.00	-.176502	-.461370	-1.275744	-1.968363	-2.244106	-.561027	-1.402984
240.00	-.130717	-.402187	-1.065807	-2.528436	-2.594244	-.648561	-1.590106
245.00	-.049623	-.339943	-.779132	-2.939088	-2.718220	-.679555	-1.714377
250.00	-.151375	-.275112	-.852974	-3.261480	-3.114453	-.778613	-1.805957
255.00	-.055705	-.208187	-.527734	-3.512362	-3.040166	-.760042	-1.874135
260.00	-.029584	-.139678	-.336524	-3.696258	-3.032782	-.758195	-1.922565
265.00	-.017123	-.070106	-.174457	-3.613977	-2.986434	-.747108	-1.952941
270.00	-.011203	-.000000	-.022405	-3.605816	-2.886222	-.722055	-1.966168
275.00	-.007757	.070106	.124098	-3.652692	-2.727994	-.681999	-1.962828
280.00	-.005585	.139678	.260186	-3.776714	-2.508526	-.627132	-1.943377
285.00	-.004136	.208187	.408103	-3.641423	-2.233320	-.558330	-1.908251
290.00	-.003126	.275112	.543972	-3.451850	-1.907678	-.476969	-1.857916
295.00	-.002397	.339943	.675092	-3.214468	-1.539376	-.384844	-1.792894
300.00	-.001855	.402187	.800662	-2.937054	-1.136392	-.284098	-1.713784
310.00	-.001124	.517041	1.031634	-2.298551	-.266717	-.066679	-1.516097
320.00	-.000668	.616186	1.231035	-1.616171	.614863	.153716	-1.271267
330.00	-.000367	.696608	1.392481	-.474261	1.418200	.354250	-.957057
340.00	-.000159	.755864	1.511409	-.451879	2.059529	.514882	-.672220
350.00	-.000014	.792153	1.584278	-.113214	2.471065	.617766	-.336472
360.00	.000084	.804373	1.608916	-.000098	2.608816	.652204	.009880

FIGURE 3-6 CONTINUED

# BEFORE COALESCENCE

N	X(N)	Y(N)	GAM(N)	XB(N)	YB(N)	GAMB(N)
1	-.843510	.508944	-.001116			
2	-.843511	.508942	-.001798	-.043510	.508944	-.001116
3	-.843511	.508942	-.002423	-.043511	.508942	-.001798
4	-1.195089	.608783	-.004710	-.043511	.508942	-.002423
5	-1.225271	.628492	-.007114	-1.195089	.608780	-.004710
6	-.896120	.659533	-.002931	-1.225271	.628499	-.007114
7	-.912873	.699431	-.001593	-.896120	.659533	-.002931
8	-.951854	.660847	-.001671	-.912873	.699431	-.001593
9	-1.072393	.621705	-.004103	-.951854	.660847	-.001671
10	-1.193338	.607523	-.013810	-1.072393	.621705	-.004103
11	-1.208890	.612132	-.014769	-1.193338	.607523	-.013816
12	-1.062157	.617097	-.008522	-1.208890	.612132	-.014769
13	-.871289	.618034	-.010307	-1.062157	.617087	-.008552
14	-1.203198	.624112	-.013593	-.871289	.616034	-.010307
15	-1.148552	.638894	-.015883	-1.203198	.624112	-.019593
16	-.955118	.659219	-.011043	-1.148552	.638894	-.018883
17	-.908095	.675676	-.018241	-.955118	.659219	-.011043
18	-.871560	.595995	-.020126	-.908095	.675676	-.018241
19	-.878499	.563013	-.021884	-.871560	.595986	-.020126
20	-.956572	.630661	-.043048	-.878499	.563013	-.021884
21	-.878923	.556931	-.038800	-.956572	.630661	-.043848
22	-.904983	.515029	-.044100	-.878923	.556931	-.038800
23	-.906310	.482912	-.038344	-.904983	.515029	-.044100
24	-.900928	.448902	-.029424	-.906310	.482912	-.038344
25	-.917299	.413596	-.030493	-.900928	.448902	-.029424
				-.917299	.413596	-.030493
11 = 4	12 = 10	LIST1 = 3	LIST2 = 3			
11 = 4	12 = 10	LIST1 = 3	LIST2 = 3			
11 = 4	12 = 12	LIST1 = 3	LIST2 = 3			
11 = 5	12 = 4	LIST1 = 3	LIST2 = 3			
11 = 7	12 = 12	LIST1 = 3	LIST2 = 3			
11 = 8	12 = 9	LIST1 = 3	LIST2 = 3			

FIGURE 3-7 COALESCENCE INFORMATION

#### 4.0 SAMPLE CASES

Three sample cases are included. The first is a nominal run with 40 time steps. The second is the same run with coalescence at time step 35. The third contains the vortex and pressure information printouts.

(namelist input)

```
$VTXIN  
KFINAL=40  
ZPERT=.05  
ZPEND=.25  
AATAACK=30  
ZLENGTH=78.272  
ZLND=2.598  
DEE=7.6  
ZINIT=.01  
KVEC=30  
$END
```

CASE 1

## DOCUMENT SAMPLE CASE

KFINAL	KPPES	KVFC	PCOAL	KRCJAL	KLOUT	KPRINT	KPRINTP	ISYM	LAM
40	5	30	0	0	0	0	0	0	0
READIN	RITEDUT	DDV	PBL	PAP	PFIX	PCOAL	UGIVE		
0.	0.	0.	0.	0.	0.	0.	1.		
TFINAL	DELT	DELTMIN	DELTMAX	ZFINAL	ZINIT	ZPERT	ZPEND	RC	XTR
500.000	0.000	.050	.125	1.000	.010	.050	.250	.050	0.000
AATACK	SIGMA	DELSTG	ZLAMDA	LPS					
30.000	.600	.100	0.000	.100					

## DOCUMENT SAMPLE CASE

## BODY GEOMETRY

LENGTH		DIAMETER		AREA			F	AW	
78.2720		7.6000		45.3646			10.2989	3.0000	
ZSTAR	RSTAR	Z	T	RZRO	DRZRO	DDRZRO	A	ADDT	ADDDT
0.0000	.0000	0.0000	0.0000	.0000	8.2333	-37.3531	.0000	.6923	-.2677
1.5654	.5973	.0200	.2378	.1572	7.4900	-36.5125	.1572	.6298	-.2582
3.1309	1.1391	.0400	.4757	.2998	6.7716	-35.3507	.2998	.5694	-.2500
4.6963	1.6272	.0600	.7135	.4282	6.0749	-34.3460	.4282	.5108	-.2429
6.2616	2.0630	.0800	.9514	.5429	5.3969	-33.4807	.5429	.4538	-.2367
7.8272	2.4479	.1000	1.1892	.6442	4.7348	-32.7406	.6442	.3981	-.2315
9.3926	2.7830	.1200	1.4271	.7324	4.0865	-32.1138	.7324	.3436	-.2271
10.9581	3.0693	.1400	1.6649	.8077	3.4496	-31.5909	.8077	.2901	-.2234
12.5235	3.3076	.1600	1.9026	.8704	2.8222	-31.1644	.8704	.2373	-.2204
14.0890	3.4985	.1800	2.1406	.9207	2.2024	-30.8262	.9207	.1852	-.2180
15.6544	3.6425	.2000	2.3784	.9586	1.5885	-30.5777	.9586	.1336	-.2162
17.2198	3.7400	.2200	2.6163	.9842	.9788	-30.4097	.9842	.0823	-.2150
18.7853	3.7913	.2400	2.8541	.9977	.3716	-30.3217	.9977	.0312	-.2144
20.3507	3.8000	.2600	3.0920	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
21.9162	3.8000	.2800	3.3298	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
23.4816	3.8000	.3000	3.5677	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
25.0470	3.8000	.3200	3.8055	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
26.6125	3.8000	.3400	4.0433	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
28.1779	3.8000	.3600	4.2812	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
29.7434	3.8000	.3800	4.5190	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
31.3088	3.8000	.4000	4.7569	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
32.8742	3.8000	.4200	4.9947	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
34.4397	3.8000	.4400	5.2326	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
36.0051	3.8000	.4600	5.4704	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
37.5706	3.8000	.4800	5.7083	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
39.1360	3.8000	.5000	5.9461	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
40.7014	3.8000	.5200	6.1839	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
42.2669	3.8000	.5400	6.4218	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
43.8323	3.8000	.5600	6.6596	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
45.3978	3.8000	.5800	6.8975	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
46.9632	3.8000	.6000	7.1353	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
48.5286	3.8000	.6200	7.3732	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000

50.0941	3.8000	.6400	7.6110	1.0000	0.0000	0.0000	0.0000
51.6595	3.8000	.6600	7.3409	1.0000	0.0000	0.0000	0.0000
53.2250	3.8000	.6800	9.0867	1.0000	0.0000	0.0000	0.0000
54.7904	3.8000	.7000	9.3245	1.0000	0.0000	0.0000	0.0000
56.3558	3.8000	.7200	8.5624	1.0000	0.0000	0.0000	0.0000
57.9213	3.8000	.7400	8.8002	1.0000	0.0000	0.0000	0.0000
59.4867	3.8000	.7600	9.0261	1.0000	0.0000	0.0000	0.0000
61.0522	3.8000	.7800	9.2759	1.0000	0.0000	0.0000	0.0000
62.6176	3.8000	.8000	9.5138	1.0000	0.0000	0.0000	0.0000
64.1830	3.8000	.8200	9.7516	1.0000	0.0000	0.0000	0.0000
65.7485	3.8000	.8400	9.9894	1.0000	0.0000	0.0000	0.0000
67.3139	3.8000	.8600	10.2273	1.0000	0.0000	0.0000	0.0000
68.8794	3.8000	.8800	10.4651	1.0000	0.0000	0.0000	0.0000
70.4448	3.8000	.9000	10.7030	1.0000	0.0000	0.0000	0.0000
72.0102	3.8000	.9200	10.9408	1.0000	0.0000	0.0000	0.0000
73.5757	3.8000	.9400	11.1787	1.0000	0.0000	0.0000	0.0000
75.1411	3.8000	.9600	11.4165	1.0000	0.0000	0.0000	0.0000
76.7066	3.8000	.9800	11.6544	1.0000	0.0000	0.0000	0.0000
78.2720	3.8000	1.0000	11.8922	1.0000	0.0000	0.0000	0.0000

## DOCUMENT SAMPLE CASE

K	TIME	Z	THTAS	THTASB	THTASR	THTASRB	COPK	CLPK	AK	AKOUT	AKOUT
1	.119	.010000	189.000	-190.000	J.000	0.000	0.000000	0.000000	.080452	.660795	-.262748
2	.169	.014204	149.399	-149.399	J.000	0.000	0.000000	0.000000	.113164	.647707	-.260766
3	.219	.018409	117.417	-117.417	J.000	0.000	0.000000	0.000000	.145225	.634715	-.258882
4	.269	.022613	114.720	-114.720	J.000	0.000	0.000000	0.000000	.176638	.521817	-.257035
5	.319	.026813	112.261	-112.261	0.000	0.000	.824950	-.000000	.207408	.609011	-.255243
6	.369	.031022	111.530	-111.530	J.000	0.000	.824950	-.000000	.237540	.596292	-.253504
7	.419	.035227	110.786	-110.786	J.000	0.000	.824950	-.000000	.267039	.583659	-.251816
8	.469	.039431	110.147	-110.147	0.000	0.000	.824950	-.000000	.295907	.571110	-.250180
9	.519	.043635	109.259	-109.259	0.000	0.000	.824950	-.000000	.324151	.558641	-.248592
10	.569	.047840	109.586	-109.586	J.000	0.000	1.234126	-.000000	.351773	.546250	-.247052
11	.619	.052044	109.123	-109.123	162.119	-162.119	1.234126	-.000000	.378777	.533935	-.245559
12	.669	.056249	107.445	-107.465	162.204	-162.204	1.234126	-.000000	.405167	.521693	-.244112
13	.720	.060509	106.967	-107.053	162.267	-162.254	1.234126	-.000000	.431277	.509366	-.242691
14	.773	.065041	106.459	-106.628	164.235	-164.178	1.234126	-.000000	.458384	.496322	-.241227
15	.831	.069459	106.208	-105.442	164.304	-164.233	1.526010	.012951	.486428	.482544	-.239725
16	.892	.074972	105.893	-106.258	164.400	-164.292	1.526010	.012951	.515326	.468015	-.238191
17	.956	.080388	105.577	-105.960	157.250	-157.195	1.526010	.012951	.544980	.452722	-.236630
18	1.024	.086117	105.193	-105.604	164.621	-164.503	1.526010	.012951	.575273	.436656	-.235049
19	1.096	.092163	104.769	-105.267	154.276	-159.125	1.526010	.012951	.606066	.419812	-.233457
20	1.172	.098534	104.467	-104.610	162.954	-162.752	1.712400	.051351	.637202	.402187	-.231861
21	1.251	.105232	104.135	-104.852	163.073	-162.805	1.712400	.051351	.666502	.383783	-.230272
22	1.335	.112259	103.713	-103.886	163.442	-155.925	1.712400	.051351	.694770	.364607	-.228699
23	1.422	.119614	103.061	-103.607	159.815	-159.636	1.712400	.051351	.730790	.344671	-.227152
24	1.514	.127295	102.890	-102.913	159.839	-159.858	1.712400	.051351	.761330	.323990	-.225643
25	1.609	.135297	101.793	-102.573	156.369	-159.947	1.759928	.081742	.791143	.302587	-.224183
26	1.708	.143513	101.800	-102.518	152.556	-126.201	1.759928	.081742	.819973	.280467	-.222783
27	1.810	.152232	99.633	-101.637	141.042	-152.609	1.759928	.081742	.847554	.257722	-.221404
28	1.916	.161141	99.732	-100.771	157.056	-160.480	1.759928	.081742	.873618	.234327	-.220208
29	2.026	.170323	99.930	-100.927	160.982	-160.360	1.759928	.081742	.897696	.210344	-.219056
30	2.138	.179761	99.659	-100.719	160.973	-160.400	1.482451	.082228	.926127	.185016	-.218006
31	2.253	.189433	99.237	-100.259	157.039	-160.504	1.482451	.082228	.940659	.160799	-.217074
32	2.370	.199314	96.132	-97.857	161.772	-157.207	1.482451	.082228	.957458	.135340	-.216263
33	2.490	.209378	96.575	-99.057	161.547	-162.337	1.482451	.082228	.972108	.109499	-.215584
34	2.611	.219596	97.027	-98.262	157.237	-158.161	1.482451	.082228	.983024	.083337	-.215042
35	2.734	.229937	97.439	-99.465	155.730	-158.128	.865121	.181671	.992447	.058918	-.214645
36	2.859	.240368	95.993	-99.117	163.254	-158.151	.865121	.181671	.997857	.030307	-.214396
37	2.983	.250657	94.219	-97.397	162.914	-162.345	.865121	.181671	.999970	.003572	-.214299
38	3.108	.261369	93.144	-95.749	157.001	-162.683	.865121	.181671	1.000000	0.000000	0.000000
39	3.233	.271879	92.745	-94.339	166.593	-158.847	.865121	.181671	1.000000	0.000000	0.000000
40	3.358	.282390	92.294	-93.967	166.652	-167.360	.552244	-.010532	1.000000	0.000000	0.000000



Z	CD	CL	THETAS	THETASB
.026818	.200238	0.000000	112.260714	-112.260719
.047840	.306531	0.000000	108.586482	-108.586482
.069859	.381502	.003238	106.207993	-106.441760
.098534	.426160	.012845	104.467467	-105.015890
.135297	.439982	.020436	101.783390	-102.573305
.174761	.370613	.020557	98.658706	-100.718952
.229937	.216280	.045418	97.437831	-98.464543
.282390	.138061	-.002645	92.283964	-93.766950
CN	CY	CSM	CSM	
1.085350	.058474	-.157943	-.011062	

(namelist input)

```
$VTXIN  
KFINAL=40  
ZPERT=.05  
ZPEND=.25  
AATAACK=30  
ZLENGTH=78.272  
ZLND=2.598  
DEE=7.6  
ZINIT=.01  
KVEC=30  
KCOAL=35  
KRCOAL=35  
PCOAL=1  
$END
```

CASE 2

ORIGINAL PAGE IS  
OF POOR QUALITY

DOCUMENT SAMPLE CASE

KFINAL	KPRES	KVEC	KCOAL	KRCOAL	KLOUT	KPRINT	KPRINTP	ISYM	LAM
40	5	30	35	35	0	0	0	0	0
READIN	RITEOUT	PRV	PBL	PAP	PFIX	PCOAL	OGIVE		
0.	0.	0.	0.	0.	0.	1.	1.		
TFINAL	DELT	DELTMIN	DELTMAX	ZFINAL	ZINIT	ZPERT	ZPEND	RC	XTR
500.000	0.000	.050	.125	1.000	.010	.050	.250	.050	0.000
AATACK	SIGMA	DELSIG	ZLANDA	EPS					
30.000	.600	.100	0.000	.100					

## DOCUMENT SAMPLE CASE

## BODY GEOMETRY

LENGTH		DIAMETER		AREA			F	AM	
78.2720		7.6000		45.3646			10.2989	3.8000	
ZSTAR	RSTAR	Z	T	RZRD	DRZRD	DDRZRD	A	ADDT	ADDDT
0.0000	.0000	0.0000	0.0000	.0000	0.2333	-37.8531	.0000	.6923	-.2677
1.0054	.5973	.0200	.2378	.1572	7.4900	-36.5125	.1572	.6296	-.2582
3.1309	1.1391	.0400	.4757	.2998	6.7716	-35.3507	.2998	.5694	-.2500
4.0963	1.6272	.0600	.7135	.4282	6.0749	-34.3460	.4282	.5108	-.2429
6.2616	2.0630	.0800	.9514	.5429	5.3969	-33.4007	.5429	.4538	-.2367
7.6272	2.4479	.1000	1.1892	.6442	4.7348	-32.7406	.6442	.3961	-.2315
9.3426	2.7830	.1200	1.4271	.7324	4.0865	-32.1138	.7324	.3436	-.2271
10.4581	3.0693	.1400	1.6649	.8077	3.4496	-31.5909	.8077	.2901	-.2234
12.5235	3.3076	.1600	1.9026	.8704	2.8222	-31.1644	.8704	.2373	-.2204
14.6090	3.4935	.1800	2.1406	.9207	2.2024	-30.8282	.9207	.1852	-.2180
15.6544	3.6425	.2000	2.3764	.9586	1.5865	-30.5777	.9586	.1336	-.2162
17.2192	3.7400	.2200	2.6163	.9842	.9788	-30.4097	.9842	.0823	-.2150
18.7653	3.7913	.2400	2.8541	.9977	.3716	-30.3217	.9977	.0312	-.2144
20.3507	3.8000	.2600	3.0920	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
21.9162	3.8000	.2800	3.3298	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
23.4616	3.8000	.3000	3.5677	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
25.0476	3.8000	.3200	3.8055	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
26.6125	3.8000	.3400	4.0433	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
28.1779	3.8000	.3600	4.2812	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
29.7434	3.8000	.3800	4.5190	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
31.3088	3.8000	.4000	4.7569	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
32.8742	3.8000	.4200	4.9947	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
34.4397	3.8000	.4400	5.2326	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
36.0051	3.8000	.4600	5.4704	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
37.5706	3.8000	.4800	5.7083	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
39.1360	3.8000	.5000	5.9461	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
40.7014	3.8000	.5200	6.1839	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
42.2669	3.8000	.5400	6.4218	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
43.8323	3.8000	.5600	6.6596	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
45.3978	3.8000	.5800	6.8975	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
46.9632	3.8000	.6000	7.1353	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
48.5286	3.8000	.6200	7.3732	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000

50.6441	3.8000	.6500	7.6110	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
51.6295	3.8000	.6600	7.3489	1.0000	6.0000	0.0000	0.0000	1.0000	0.0000	0.0000
53.2250	3.8000	.6800	8.0867	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
54.7904	3.8000	.7000	8.3245	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
56.3558	3.8000	.7200	8.5624	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
57.9213	3.8000	.7400	8.8002	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
59.4867	3.8000	.7600	9.0381	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
61.0522	3.8000	.7800	9.2759	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
62.6176	3.8000	.8000	9.5138	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
64.1830	3.8033	.8200	9.7516	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
65.7485	3.8000	.8400	9.9894	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
67.3139	3.8000	.8600	10.2273	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
68.8794	3.8000	.8800	10.4651	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
70.4448	3.3000	.9000	10.7030	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
72.0102	3.8000	.9200	10.9408	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
73.5757	3.8000	.9400	11.1787	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
75.1411	3.8000	.9600	11.4165	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
76.7066	3.8000	.9800	11.6544	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
78.2724	3.8000	1.0000	11.8922	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000

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## DOCUMENT SAMPLE CASE

K	TIME	Z	THETAS	THETASB	THETASR	THETASRB	CDPK	CLPK	AK	AKDOT	AKDOT
1	.119	.010000	130.000	-130.000	0.000	0.000	0.000000	0.000000	.080452	.660795	-.262748
2	.169	.014204	149.399	-149.399	0.000	0.360	0.000000	0.000000	.113164	.647707	-.260786
3	.219	.018409	117.417	-117.417	0.000	0.090	0.000000	0.000000	.145225	.634715	-.258882
4	.269	.022613	114.720	-114.720	0.000	0.000	0.000000	0.000000	.176638	.621817	-.257035
5	.319	.026818	112.261	-112.261	0.000	0.000	0.000000	0.000000	.207408	.609011	-.255243
6	.369	.031022	111.530	-111.530	0.000	0.000	.824950	-.000000	.237540	.596292	-.253504
7	.419	.035227	110.786	-110.786	0.000	0.000	.824950	-.000000	.267039	.583659	-.251816
8	.469	.039431	110.147	-110.147	0.000	0.000	.824950	-.000000	.295907	.571110	-.250180
9	.519	.043635	109.259	-109.259	0.000	0.000	.824950	-.000000	.324151	.558641	-.248592
10	.569	.047840	108.586	-108.586	0.000	0.000	1.234126	-.000000	.351773	.546250	-.247052
11	.619	.052044	108.123	-108.123	162.119	-162.119	1.234126	-.000000	.378777	.533935	-.245559
12	.669	.056249	107.465	-107.465	162.204	-162.204	1.234126	-.000000	.405167	.521693	-.244112
13	.720	.060508	106.967	-106.967	162.267	-162.267	1.234126	-.000000	.431277	.509366	-.242691
14	.773	.065041	106.459	-106.459	164.235	-164.178	1.234126	-.000000	.458384	.498322	-.241227
15	.831	.069859	106.209	-106.442	164.304	-164.233	1.526010	.012951	.486428	.482544	-.239725
16	.892	.074972	105.893	-106.256	164.400	-164.292	1.526010	.012951	.515326	.463015	-.238191
17	.956	.080388	105.577	-105.960	157.250	-157.195	1.526010	.012951	.544980	.452722	-.236630
18	1.024	.086117	105.193	-105.604	164.621	-164.563	1.526010	.012951	.575273	.436656	-.235049
19	1.096	.092163	104.769	-105.267	159.276	-159.125	1.526010	.012951	.606066	.419812	-.233457
20	1.172	.098534	104.467	-105.016	162.954	-162.752	1.712400	.051381	.637202	.402167	-.231861
21	1.251	.105232	104.135	-104.552	163.073	-162.605	1.712400	.051381	.668502	.383783	-.230272
22	1.335	.112258	103.213	-103.886	163.442	-155.925	1.712400	.051381	.694770	.364007	-.228699
23	1.422	.119614	102.961	-103.607	159.815	-159.638	1.712400	.051381	.730790	.344671	-.227152
24	1.514	.127295	102.800	-102.913	159.839	-159.858	1.712400	.051381	.761330	.323990	-.225643
25	1.609	.135297	101.783	-102.573	156.369	-159.947	1.759928	.081742	.791143	.302587	-.224103
26	1.708	.143613	101.800	-102.518	152.556	-156.201	1.759928	.081742	.819973	.280467	-.222783
27	1.810	.152232	99.633	-101.637	149.042	-152.609	1.759928	.081742	.847554	.257722	-.221454
28	1.916	.161141	99.732	-100.771	137.056	-160.480	1.759928	.081742	.873618	.234327	-.220208
29	2.026	.170323	99.830	-100.927	160.982	-160.380	1.759928	.081742	.897896	.210344	-.219056
30	2.138	.179761	99.659	-100.719	160.973	-160.400	1.482451	.082228	.920127	.185816	-.218008
31	2.253	.189433	98.237	-100.259	157.039	-160.504	1.482451	.082228	.940059	.160799	-.217074
32	2.370	.199314	96.132	-97.857	161.772	-157.207	1.482451	.082228	.957458	.135340	-.216263
33	2.490	.209378	96.576	-98.057	161.547	-162.337	1.482451	.082228	.972108	.109499	-.215564
34	2.611	.219596	97.027	-98.462	157.247	-158.161	1.482451	.082228	.983824	.083337	-.215042

# BEFORE COALESCENCE

N	X(N)	Y(N)	GAM(N)	XB(N)	YB(N)	GAMB(N)
1	-.843510	.508944	-.J01116	-.843510	.508944	-.001116
2	-.843511	.508942	-.J01798	-.843511	.508942	-.001798
3	-.843511	.508942	-.J02423	-.843511	.508942	-.002423
4	-1.195089	.608787	-.J04710	-1.195089	.608780	-.004710
5	-1.225271	.628499	-.J07114	-1.225271	.628499	-.007114
6	-.898120	.653533	-.J02931	-.898120	.653533	-.002931
7	-.912873	.699431	-.J01593	-.912873	.699431	-.001593
8	-.951854	.660847	-.J01671	-.951854	.660847	-.001671
9	-1.072383	.621705	-.J04188	-1.072383	.621705	-.004188
10	-1.193338	.607523	-.J13316	-1.193338	.607523	-.013316
11	-1.208890	.612132	-.J14769	-1.208890	.612132	-.014769
12	-1.062157	.617087	-.J08552	-1.062157	.617087	-.008552
13	-.871289	.618034	-.J10307	-.871289	.618034	-.010307
14	-1.203198	.624112	-.J19593	-1.203198	.624112	-.019593
15	-1.148552	.638894	-.J16883	-1.148552	.638894	-.016883
16	-.955118	.659219	-.J11043	-.955118	.659219	-.011043
17	-.908095	.675676	-.J18241	-.908095	.675676	-.018241
18	-.871560	.595986	-.J2J126	-.871560	.595986	-.02J126
19	-.878499	.563013	-.J21884	-.878499	.563013	-.021884
20	-.956572	.630661	-.J43648	-.956572	.630661	-.043648
21	-.878923	.556931	-.J38800	-.878923	.556931	-.038800
22	-.904983	.515029	-.J44100	-.904983	.515029	-.044100
23	-.906310	.482912	-.J36344	-.906310	.482912	-.036344
24	-.900928	.468802	-.J29424	-.900928	.468802	-.029424
25	-.917299	.413596	-.J30493	-.917299	.413596	-.030493
I1 = 4	I2 = 10	LIST1 = 3	LIST2 = 3			
I1 = 4	I2 = 10	LIST1 = 3	LIST2 = 3			
I1 = 4	I2 = 12	LIST1 = 3	LIST2 = 3			
I1 = 5	I2 = 4	LIST1 = 3	LIST2 = 3			
I1 = 7	I2 = 12	LIST1 = 3	LIST2 = 3			
I1 = 8	I2 = 9	LIST1 = 3	LIST2 = 3			

# AFTER COALESCENCE

N	X(N)	Y(N)	GAM(N)	XB(N)	YB(N)	GAMB(N)
1	-.843510	.508944	-.J01116	-.843510	.508944	-.J01116
2	-.843511	.508942	-.001798	-.843511	.508942	-.001798
3	-.843511	.508942	-.002423	-.843511	.508942	-.002423
4	-1.204309	.616660	-.J6J002	-1.204309	.616660	-.060002
5	-.898120	.653533	-.0J2931	-.898120	.653533	-.002931
6	-.912873	.699431	-.J01593	-.912873	.699431	-.001593
7	-.954689	.659433	-.J12714	-.954689	.659433	-.012714
8	-1.065518	.618605	-.J12740	-1.065518	.618605	-.012740
9	-.871289	.618034	-.01J307	-.871289	.618034	-.010307
10	-1.148552	.638894	-.J16883	-1.148552	.638894	-.016883
11	-.908095	.675676	-.018241	-.908095	.675676	-.018241
12	-.871560	.595986	-.J2J126	-.871560	.595986	-.02J126
13	-.878499	.563013	-.021884	-.878499	.563013	-.021884
14	-.956572	.630661	-.J43648	-.956572	.630661	-.043648
15	-.878923	.556931	-.J38800	-.878923	.556931	-.038800
16	-.904983	.515029	-.044100	-.904983	.515029	-.044100
17	-.906310	.482912	-.036344	-.906310	.482912	-.036344
18	-.900928	.468802	-.J29424	-.900928	.468802	-.029424
19	-.917299	.413596	-.030493	-.917299	.413596	-.030493



# AFTER COALESCENCE

N	X(N)	Y(N)	GA1(N)	XB(N)	YB(N)	GAMB(N)
1	-.847351	-.503274	.001116	-.643510	.508944	-.001116
2	-.840480	-.533619	.001798	-.843511	.508942	-.001798
3	-.860595	-.673760	.002419	-.843511	.508942	-.002423
4	-1.305839	-.460032	.004729	-1.204309	.616660	-.066002
5	-1.350606	-.475323	.007223	-.898120	.653533	-.002931
6	-.906181	-.647009	.003009	-.912873	.699431	-.001593
7	-.917097	-.674110	.001060	-.954689	.659433	-.012714
8	-.925509	-.663450	.001644	-1.065518	.616605	-.012740
9	-1.377399	-.450310	.003909	-.871289	.618034	-.010307
10	-1.348216	-.330909	.012594	-1.148552	.638894	-.016883
11	-1.464450	-.192322	.014066	-.908095	.675676	-.016241
12	-1.119047	-.660867	.006227	-.871560	.595986	-.026126
13	-1.084290	-.669930	.010340	-.878499	.563013	-.021884
14	-1.224962	-.517343	.017804	-.956572	.630661	-.043646
15	-.973744	-.680274	.014813	-.878923	.556931	-.034600
16	-.950104	-.670034	.015556	-.904933	.515029	-.044100
17	-.920729	-.659751	.017940	-.906310	.482912	-.036344
18	-.880988	-.604830	.030330	-.900928	.466802	-.029424
19	-.936216	-.615498	.014722	-.917299	.413596	-.030493
20	-.892473	-.534767	.028796			
21	-.940011	-.553977	.037453			
22	-.903225	-.537937	.034150			
23	-.899533	-.466237	.025524			
24	-.902786	-.454524	.019388			
25	-.933883	-.374830	.030871			

Z	CL	CL	THETAS	THETASB
.026418	.206238	0.000000	112.260719	-112.260719
.047940	.303531	0.000000	108.586482	-108.586482
.069459	.381502	.003238	106.207993	-106.441760
.098534	.428100	.012845	104.467407	-105.015890
.135297	.439982	.020436	101.763390	-102.573306
.179761	.370613	.020557	98.658705	-100.718952
.224937	.216246	.044505	97.437831	-98.464543
.282390	.137885	-.002477	92.298054	-93.393754
CM	CY	CSM	CSM	
1.085266	.758002	-.157920	-.010956	

(namelist input)

```
$VTXIN  
KFINAL=40  
ZPERT=.05  
ZPEND=.25  
AATAK=30  
ZLENGTH=78.272  
ZLND=2.596  
DEE=7.6  
ZINIT=.01  
KVEC=30  
KPRINT=10  
KPRINTP=20  
$END
```

CASE 3

## DOCUMENT SAMPLE CASE

KFINAL	KPRTS	KVFC	KCDAL	KRCOAL	KLOUT	KPRINT	KPRINTP	ISYM	LAM
40	5	37	0	0	0	10	20	0	0
RADIN	RITFOUT	DDV	PBL	PAP	PFIX	PCOAL	CGIVE		
0.	0.	0.	0.	0.	0.	0.	1.		
TFINAL	DELT	DELTMIN	DELTMAX	ZFINAL	ZINIT	ZPERT	ZPEND	RC	XTR
500.000	0.070	.057	.125	1.000	.010	.050	.250	.050	0.000
AATACK	SIGMA	DELSTG	ZLAMDA	EPS					
30.000	.600	.100	0.000	.100					

DOCUMENT SAMPLE CASE

BODY GEOMETRY

LENGTH		DIAMETER		AREA		F	AW		
78.2720		7.6000		45.3646		10.2709	3.8000		
ZSTAK	RSTAR	7	1	RZKO	DRZKO	DORZKO	A	ADDT	ADDT
0.0000	.0000	0.0000	0.0000	.0000	8.2333	-37.8531	.0000	.6923	-.2677
1.5654	.5973	.0200	.2370	.1572	7.4900	-36.5125	.1572	.6298	-.2552
3.1309	1.1391	.0400	.4757	.2948	6.7716	-35.3507	.2948	.5694	-.2500
4.6963	1.6272	.0600	.7135	.4292	6.0749	-34.3460	.4292	.5108	-.2429
6.2616	2.0630	.0800	.9514	.5429	5.3969	-33.4807	.5429	.4538	-.2367
7.8272	2.4479	.1000	1.1892	.6442	4.7346	-32.7406	.6442	.3961	-.2315
9.3926	2.7830	.1200	1.4271	.7324	4.0865	-32.1138	.7324	.3436	-.2271
10.9581	3.0693	.1400	1.6649	.8077	3.4496	-31.5909	.8077	.2901	-.2234
12.5235	3.3076	.1600	1.9028	.8704	2.8222	-31.1644	.8704	.2373	-.2204
14.0890	3.4985	.1800	2.1406	.9207	2.2024	-30.8262	.9207	.1852	-.2180
15.6544	3.6425	.2000	2.3784	.9586	1.5885	-30.5777	.9586	.1336	-.2162
17.2198	3.7400	.2200	2.6163	.9842	.9788	-30.4097	.9842	.0823	-.2150
18.7853	3.7913	.2400	2.8541	.9977	.3716	-30.3217	.9977	.0312	-.2144
20.3507	3.8000	.2600	3.0920	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
21.9162	3.8000	.2800	3.3298	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
23.4816	3.8000	.3000	3.5677	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
25.0470	3.8000	.3200	3.8055	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
26.6125	3.8000	.3400	4.0433	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
28.1779	3.8000	.3600	4.2812	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
29.7434	3.8000	.3800	4.5190	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
31.3088	3.8000	.4000	4.7569	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
32.8742	3.8000	.4200	4.9947	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
34.4397	3.8000	.4400	5.2326	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
36.0051	3.8000	.4600	5.4704	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
37.5706	3.8000	.4800	5.7083	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
39.1360	3.8000	.5000	5.9461	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
40.7014	3.8000	.5200	6.1839	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
42.2669	3.8000	.5400	6.4218	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
43.8323	3.8000	.5600	6.6596	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
45.3978	3.8000	.5800	6.8975	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000

46.9632	3.8000	.6000	7.1353	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
48.5286	3.8000	.6200	7.3732	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
50.0941	3.8000	.6400	7.6110	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
51.6595	3.8000	.6500	7.8489	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
53.2250	3.8000	.6800	8.0867	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
54.7904	3.8000	.7000	8.3245	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
56.3558	3.8000	.7200	8.5624	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
57.9213	3.8000	.7400	8.8002	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
59.4867	3.8000	.7600	9.0381	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
61.0522	3.8000	.7800	9.2759	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
62.6176	3.8000	.8000	9.5136	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
64.1830	3.8000	.9200	9.7516	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
65.7485	3.8000	.8400	9.9894	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
67.3139	3.8000	.9500	10.2273	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
68.8794	3.8000	.9800	10.4651	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
70.4448	3.8000	.9000	10.7030	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
72.0102	3.8000	.9200	10.9408	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
73.5757	3.8000	.7400	11.1787	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
75.1411	3.8000	.9500	11.4165	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
76.7066	3.8000	.9800	11.6544	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000
78.2720	3.8000	1.0000	11.8922	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000

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## DOCUMENT SAMPLE CASE

K	TIME	Z	THETAS	THETASB	THETASR	THETASRB	CDPK	CLPK	AK	AKDOT	AKDDT
1	.119	.010000	189.000	-189.000	0.000	0.000	0.000000	0.000000	.060452	.660755	-.262748
2	.169	.014204	149.399	-149.399	0.000	0.000	0.000000	0.000000	.113164	.647707	-.260786
3	.219	.018409	117.417	-117.417	0.000	0.000	0.000000	0.000000	.145225	.634715	-.258682
4	.269	.022613	114.720	-114.720	0.000	0.000	0.000000	0.000000	.176636	.621817	-.257035
5	.319	.026818	112.261	-112.261	0.000	0.000	.824950	-.000000	.207406	.609011	-.255243
6	.369	.031022	111.530	-111.530	0.000	0.000	.824950	-.000000	.237540	.596252	-.253504
7	.419	.035227	110.786	-110.786	0.000	0.000	.824950	-.000000	.267039	.583659	-.251816
8	.469	.039431	110.147	-110.147	0.000	0.000	.824950	-.000000	.295907	.571110	-.250160
9	.519	.043635	109.259	-109.259	0.000	0.000	.824950	-.000000	.324151	.558641	-.248592

N	K	X	Y	YDUT	XOUT	YDUT	GAMMA	XU	YB	ADJTB	YDGTB	XGDTB	YDGTB	GAMMAB
1	10	-.392	.011	-.456	.014	.715	.010	-.372	-.011	-.456	-.014	.715	-.234	-.016
2	10	-.412	.084	-.604	-.040	1.245	.047	-.412	-.084	-.604	.040	1.245	-.035	-.047
3	10	-.396	.117	-.545	-.039	1.272	.050	-.396	-.117	-.545	.039	1.272	-.182	-.050
4	10	-.385	.156	-.803	-.050	-.795	.051	-.385	-.156	-.803	.050	-.795	-2.855	-.051
5	10	-.361	.199	-.814	-.206	3.880	.052	-.361	-.199	-.814	.206	3.880	1.479	-.052
6	10	-.321	.235	-1.028	-.121	2.050	.052	-.321	-.235	-1.028	.121	2.050	-.140	-.052
7	10	-.273	.270	-1.151	-.128	7.454	.052	-.273	-.270	-1.151	.128	7.454	-2.813	-.052
8	10	-.202	.313	-1.554	-.261	5.760	.052	-.202	-.313	-1.554	.261	5.760	4.514	-.052
9	10	-.115	.342	-1.844	-.029	-36.882	.052	-.115	-.342	-1.844	.029	-36.882	.577	-.052



## DOCUMENT SAMPLE CASE

K	TIME	Z	THETAS	THETASB	THETASR	THETASRB	CLPK	CLPK	AK	AKDJ1	AKDJT
10	.569	.047840	109.585	-109.586	0.000	0.000	1.234126	-.000000	.351773	.548250	-.247052
11	.615	.052044	109.123	-109.123	162.119	-162.119	1.234126	-.000000	.378777	.533935	-.245559
12	.664	.056249	107.465	-107.465	162.204	-162.204	1.234126	-.000000	.405107	.521693	-.244112
13	.720	.060508	106.967	-107.053	162.267	-162.254	1.234126	-.000000	.431277	.509300	-.242691
14	.775	.065041	106.459	-106.626	164.235	-164.178	1.234126	-.000000	.458384	.496322	-.241227
15	.831	.069659	106.208	-106.442	164.304	-164.233	1.526010	.012951	.486428	.482544	-.239725
16	.892	.074972	105.893	-106.258	164.400	-164.292	1.526010	.012951	.513326	.468019	-.238191
17	.956	.080388	105.577	-105.960	157.250	-157.195	1.526010	.012951	.544980	.452722	-.236630
18	1.024	.086117	105.183	-105.604	164.621	-164.503	1.526010	.012951	.575273	.436656	-.235049
19	1.096	.092163	104.769	-105.267	159.276	-159.125	1.526010	.012951	.600056	.419812	-.233457

N	K	X	Y	XDOT	YDOT	XDOT	YDOT	GAMMA	X8	Y8	XDOT8	YDOT8	XDOT8	YDOT8	GAMMA8
1	20	-.620	.083	-.335	.500	.725	2.753	.016	-.629	-.595	-.321	-.011	.819	-2.941	-.016
2	20	-.646	.232	-.381	.457	.301	-.026	.047	-.649	-.236	-.428	-.435	-.108	1.048	-.047
3	20	-.616	.259	-.257	.440	.248	-.304	.050	-.620	-.263	-.280	-.350	.336	1.447	-.050
4	20	-.673	.131	-.237	.396	-.343	2.080	.051	-.673	-.130	-.242	-.414	-.429	-2.116	-.051
5	20	-.703	.129	-.225	.186	.373	1.762	.052	-.702	-.134	-.230	-.213	.294	-1.944	-.052
6	20	-.734	.131	-.205	-.033	1.230	1.823	.052	-.733	-.130	-.196	-.008	1.326	-2.158	-.052
7	20	-.784	.179	-.478	-.481	3.059	-1.747	.052	-.774	-.174	-.467	.417	2.159	-.440	-.052
8	20	-.751	.222	-.775	-.207	-.327	.732	.052	-.750	-.235	-.736	.256	1.385	1.437	-.052
9	20	-.721	.254	-.623	-.293	1.402	-.350	.052	-.721	-.266	-.752	.253	.933	1.134	-.052
10	20	-.666	.312	-.817	-.140	-.346	-1.664	.053	-.739	-.296	-.924	.279	.359	.636	-.047
11	20	-.694	.330	-.916	-.245	-.059	-.544	.053	-.645	-.345	-.813	.100	-.190	.923	-.047
12	20	-.603	.369	-.708	-.005	.743	-.745	.053	-.611	-.355	-.697	.025	.238	.146	-.048
13	20	-.586	.385	-.744	-.016	-.206	2.450	.057	-.587	-.383	-.760	-.001	-.212	-2.467	-.051
14	20	-.567	.427	-.800	-.211	2.260	-1.092	.061	-.566	-.421	-.790	.204	2.296	.965	-.055
15	20	-.521	.462	-.970	-.124	1.162	.574	.065	-.522	-.456	-.957	.129	1.229	-.724	-.058
16	20	-.467	.501	-1.051	-.166	1.983	.361	.089	-.469	-.496	-1.041	.180	2.082	-.455	-.061
17	20	-.398	.544	-1.195	-.198	5.779	1.077	.073	-.400	-.540	-1.192	.226	5.615	-.861	-.065
18	20	-.292	.596	-1.393	-.169	0.190	-1.665	.078	-.295	-.592	-1.611	.297	3.101	3.171	-.069
19	20	-.163	.630	-1.858	-.050	-24.226	-.056	.062	-.168	-.627	-1.640	.065	-24.292	.863	-.073

N	K	XPT	YRT	YRDOT	YRDUY	XRDDI	YRCDT	GMART	XRB	YRB	XRDDTB	YRDDTB	XRDDTB	YKDDTB	GMARB
1	20	-.555	.301	-.235	.390	.557	.519	-.001	-.558	-.296	-.223	-.405	.947	-1.131	.001
2	20	-.556	.299	-.232	.394	.530	.422	-.002	-.558	-.294	-.218	-.411	.941	-1.106	.002
3	20	-.558	.296	-.227	.401	.506	.294	-.002	-.560	-.292	-.214	-.418	.939	-1.035	.002
4	20	-.570	.294	-.247	.440	.423	.175	-.005	-.572	-.293	-.246	-.457	.783	-.826	.005
5	20	-.582	.295	-.307	.462	.123	-.221	-.007	-.585	-.294	-.195	-.355	2.108	1.078	.007
6	20	-.588	.253	-.271	.421	.243	-.245	-.003	-.583	-.255	-.289	-.332	.187	.561	.003
7	20	-.567	.294	-.237	.424	.452	.109	-.002	-.564	-.292	-.232	-.450	.815	-.857	.002
8	20	-.602	.213	-.221	.588	.737	.940	-.002	-.601	-.215	-.152	-.751	1.627	-3.089	.002
9	20	-.592	.250	-.275	.439	.250	-.495	-.004	-.591	-.251	-.289	-.405	.104	.912	.004
10	20	-.616	.169	-.193	.681	-2.543	8.990	-.014	-.615	-.191	-.203	-.665	-2.679	-8.777	.013

T= 1.1718      Z= .0775      PRESSURE DISTRIBUTION      A4= .6372      AKDCI= .4022      THETA= 104.47

DEG	PHIIV	PHIIVT	2(PHIV)	-PSIKSCD	CPK	CP3D	JTAN
0.00	.000084	.804373	1.604916	-.100098	2.600616	.652204	.009880
10.00	.000141	.772153	1.504339	-.126593	2.457695	.514424	.356220
20.00	.000153	.755864	1.512033	-.476765	2.033267	.508317	.691924
30.00	.000104	.676609	1.343424	-1.613437	1.374987	.344997	1.006098
40.00	-.000035	.616186	1.232302	-1.666214	.566666	.141522	1.290819
50.00	-.000325	.517041	1.033432	-2.357067	-.324235	-.301059	1.535470
60.00	-.000893	.402187	.802567	-3.003017	-1.200430	-.300108	1.732922
65.00	-.001357	.339949	.677172	-3.262888	-1.605716	-.401429	1.611874
70.00	-.002016	.275112	.546193	-3.522007	-1.975815	-.493924	1.676731
75.00	-.002469	.209187	.410435	-3.712532	-2.302097	-.575524	1.926793
80.00	-.004388	.139673	.270580	-3.847913	-2.577333	-.644333	1.461614
85.00	-.006579	.070106	.127054	-3.923016	-2.795962	-.693991	1.980661
90.00	-.010143	.000000	-.020285	-3.934159	-2.954445	-.738011	1.933472
95.00	-.016400	-.070106	-.173012	-3.879019	-3.052031	-.763005	1.969522
100.00	-.024765	-.139678	-.336886	-3.756334	-3.093219	-.773305	1.938126
105.00	-.038731	-.209187	-.533337	-3.565226	-3.099063	-.774766	1.848101
110.00	-.058676	-.275112	-.887575	-3.303083	-3.191258	-.797915	1.817604
115.00	-.084425	-.339949	-.796735	-2.954821	-2.761557	-.890309	1.721886
120.00	-.116220	-.402187	-1.794313	-2.525960	-3.320794	-.930198	1.569333
125.00	-.152534	-.461370	-1.307005	-1.909872	-2.217678	-.954420	1.381981
130.00	-.192805	-.517041	-2.390492	-.897267	-2.287759	-.971940	.947242
135.00	-.233357	-.563778	-2.584270	-.222582	-1.806851	-.951713	.471786
140.00	-.276782	-.616186	-2.605935	-.049401	-1.655330	-.913334	.222264
145.00	-.324051	-.658904	-2.615911	-.003002	-1.616913	-.840428	-.054789
150.00	-.374720	-.696609	-2.553055	-.039484	-1.607539	-.801685	-.198700
155.00	-.424943	-.729010	-2.487906	-.037421	-1.525327	-.781332	-.193445
160.00	-.475658	-.755864	-2.343063	-.213023	-1.556086	-.789321	-.461544
165.00	-.525717	-.776965	-2.225303	-.370418	-1.595781	-.798945	-.608620
170.00	-.571172	-.792153	-1.946650	-.478113	-1.424763	-.786191	-.691457
175.00	-.612378	-.801312	-1.927381	-.673795	-1.001176	-.750294	-.271652
180.00	-.659227	-.804373	-1.930001	-.000011	-.930612	-.723253	-.003341
185.00	-.707893	-.801312	-1.918412	-.065459	-.783870	-.745908	.255649
190.00	-.752265	-.792153	-1.908837	-.450850	-1.359687	-.733922	.671453
195.00	-.791131	-.776965	-2.176192	-.369236	-1.545428	-.786357	.607648
200.00	-.824242	-.755864	-2.276575	-.177214	-1.453789	-.763447	.420908
205.00	-.861748	-.729010	-2.381516	-.025123	-1.406638	-.731660	.156502
210.00	-.893287	-.696609	-2.477790	-.033596	-1.513386	-.783347	.183293
215.00	-.919256	-.658904	-2.475320	-.000567	-1.476887	-.736922	-.023818

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ORIGINAL PAGE IS  
OF POOR QUALITY

220.00	-.621444	-.516136	-2.475254	-.079615	-1.554874	-.368719	-.282161
225.00	-.325536	-.559779	-1.775027	-.833564	-1.011941	-.402440	-.912086
230.00	-.606549	-.517041	-2.247230	-1.043195	-2.291175	-.572744	-1.021712
235.00	-.170502	-.461370	-1.275744	-1.565363	-2.244106	-.561027	-1.402484
240.00	-.130717	-.402197	-1.005807	-2.523436	-2.594244	-.648301	-1.590108
245.00	-.049623	-.339943	-.774132	-2.539086	-2.710220	-.679555	-1.714377
250.00	-.151375	-.275112	-.852974	-3.261460	-3.114453	-.778613	-1.805957
255.00	-.055705	-.209187	-.527734	-3.512302	-3.040106	-.760042	-1.674135
260.00	-.026584	-.139478	-.335524	-3.696258	-3.332732	-.758195	-1.922565
265.00	-.017123	-.071106	-.174457	-3.813477	-2.988434	-.747108	-1.952941
270.00	-.011203	-.000000	-.022405	-3.865816	-2.388222	-.722055	-1.966166
275.00	-.007757	.071106	.124698	-3.852692	-2.727994	-.681999	-1.962828
280.00	-.005585	.139678	.263186	-3.776714	-2.508528	-.627132	-1.943377
285.00	-.004136	.208187	.408103	-3.641423	-2.233320	-.558350	-1.908251
290.00	-.003126	.275112	.543972	-3.451850	-1.907878	-.476969	-1.857916
295.00	-.002397	.339943	.675092	-3.214468	-1.539376	-.384844	-1.792894
300.00	-.001855	.402187	.800662	-2.937054	-1.136392	-.284098	-1.713784
310.00	-.001124	.517041	1.031634	-2.298551	-.266717	-.068879	-1.516097
320.00	-.000668	.616186	1.231035	-1.616171	.614663	.153716	-1.271287
330.00	-.000367	.695609	1.392481	-.974281	1.418200	.354553	-.987057
340.00	-.000159	.755864	1.511409	-.451079	2.059529	.514832	-.672220
350.00	-.000014	.792153	1.584278	-.113214	2.471065	.617766	-.336472
360.00	.000084	.804373	1.608916	-.000098	2.608818	.652204	.009880

## DOCUMENT SAMPLE CASE

K	TIME	Z	THETAS	THETASb	THIASK	THTASKB	CDPK	CLPK	AK	AKOUT	AKDDT
20	1.172	.098534	104.467	-115.016	162.924	-162.752	1.712400	.051331	.037202	.402167	-.231361
21	1.251	.105232	104.135	-104.052	163.073	-162.305	1.712400	.051331	.560502	.303703	-.230272
22	1.335	.112258	103.213	-103.086	163.442	-155.925	1.712400	.051331	.094770	.364607	-.228699
23	1.422	.115614	102.761	-103.007	159.015	-155.638	1.712400	.051331	.730790	.344671	-.227152
24	1.514	.127295	102.800	-102.413	157.839	-159.858	1.712400	.051331	.761330	.323940	-.225643
25	1.609	.135297	101.783	-102.575	150.309	-154.947	1.759928	.081742	.791143	.302567	-.224183
26	1.706	.143613	101.900	-102.516	152.556	-156.201	1.759928	.081742	.819973	.283407	-.222783
27	1.810	.152232	98.633	-101.037	149.042	-152.809	1.759928	.081742	.847554	.257722	-.221454
28	1.916	.161141	98.732	-100.771	157.056	-160.480	1.759928	.081742	.873616	.234327	-.220208
29	2.026	.170323	98.830	-100.927	160.982	-160.300	1.759928	.081742	.897896	.210344	-.219056

N	K	X	Y	XDOT	YDOT	XDDT	YDDT	GAMMA	XB	YB	XDOTB	YDOTB	XDDTB	YDDTB	GAMMAB
1	30	-.775	.539	-.237	.042	.344	-.561	.016	-.812	-.540	-.302	-.294	.010	-.512	-.016
2	30	-.966	.485	-.355	.239	.010	-.163	.047	-1.033	-.418	-.309	-.040	.092	-.727	-.047
3	30	-1.012	.514	-.426	-.270	-1.311	.561	.050	-1.041	-.429	-.366	-.035	.705	-1.362	-.050
4	30	-.902	.603	-.536	.269	-.901	-.792	.051	-.965	-.535	-.035	.146	.904	1.183	-.051
5	30	-.989	.545	-.345	.353	-.408	-.395	.052	-.874	-.535	-.307	-.333	-.929	.504	-.052
6	30	-.812	.543	-.257	.254	-.737	-2.004	.052	-.880	-.500	-.300	-.372	-.959	.474	-.052
7	30	-.898	.391	-.040	.590	-.214	-.084	.052	-.802	-.399	-.064	-.519	-.017	.892	-.052
8	30	-.934	.195	.040	.692	.405	1.641	.052	-.902	-.214	.077	-.562	-.216	-1.956	-.052
9	30	-.944	.290	.014	.710	-.295	1.863	.052	-.953	-.283	-.096	-.627	.124	-.145	-.052
10	30	-1.073	.091	.155	-.053	.981	.900	.053	-1.064	-.052	.190	-.043	.370	-.489	-.047
11	30	-1.004	.091	.087	.261	-.550	1.260	.053	-1.014	-.150	.135	-.232	.034	-1.959	-.047
12	30	-.996	.354	-.193	.306	.003	.270	.053	-1.024	-.394	-.444	-.074	-.587	.473	-.048
13	30	-1.012	.380	-.174	.311	-.320	1.055	.057	-1.042	-.322	-.139	-.029	.865	.146	-.051
14	30	-1.072	.238	-.075	-.226	1.546	2.013	.061	-1.069	-.251	-.040	.021	.844	-.608	-.055
15	30	-1.022	.245	.112	.210	.945	2.273	.065	-1.064	-.291	-.114	.066	.703	-.066	-.058
16	30	-1.154	.183	-.036	-.235	1.065	.822	.069	-1.170	-.170	.023	.222	1.331	-1.283	-.061
17	30	-1.286	.243	-.345	-.423	1.360	.726	.073	-1.163	-.295	-.338	.378	1.515	-.317	-.065
18	30	-1.088	.400	-.445	-.351	1.342	-.345	.078	-1.269	-.306	-.469	.545	1.453	-.567	-.069
19	30	-1.074	.414	-.474	-.340	.061	-.505	.082	-1.113	-.470	-.631	.524	1.082	1.493	-.073
20	30	-1.154	.455	-.797	-.742	2.335	-1.434	.087	-1.083	-.486	-.070	.518	.181	1.501	-.076
21	30	-1.007	.561	-.764	-.410	1.420	-1.077	.092	-.988	-.559	-.732	.317	.416	1.213	-.080
22	30	-.953	.625	-1.016	-.367	-.773	-2.431	.096	-.948	-.507	-1.017	.197	-1.217	.802	-.084
23	30	-.885	.666	-.985	-.064	-.799	.256	.100	-.866	-.643	-.780	.137	.192	-.039	-.088
24	30	-.793	.698	-.731	-.150	1.148	.181	.105	-.796	-.584	-.767	.142	.570	-.297	-.092
25	30	-.725	.747	-.958	-.124	.571	.501	.109	-.723	-.726	-.874	.160	.879	-.623	-.095
26	30	-.599	.801	-.972	-.269	1.348	.243	.116	-.625	-.779	-.954	.242	1.508	-.451	-.099
27	30	-.481	.858	-1.163	-.274	1.829	-.687	.119	-.504	-.339	-1.121	.307	1.841	.554	-.102
28	30	-.342	.901	-1.340	-.203	4.450	-1.318	.122	-.369	-.886	-1.307	.250	4.321	1.189	-.105
29	30	-.142	.930	-1.930	-.072	-10.309	-.646	.125	-.175	-.922	-1.785	.133	-15.903	1.186	-.107

N	K	XPT	YPT	XRDT	YKDT	XRDT	YKDT	GMART	XRB	YR	XRDTB	YRDTB	XRDTB	YRDTB	GMARB
1	30	-.746	.501	.050	.063	.020	1.002	-.001	-.730	-.517	-.258	-.045	-1.889	-.973	.001
2	30	-.746	.501	.050	.063	.035	1.022	-.002	-.707	-.541	-.329	.034	.445	-.199	.002
3	30	-.746	.501	.050	.083	.033	1.018	-.002	-.714	-.663	-.355	-.010	.334	.029	.002
4	30	-.835	.595	-.487	.280	-.425	-.197	-.005	-.944	-.546	-.548	.179	1.022	1.183	.005
5	30	-.854	.592	-.520	.159	-.933	-.029	-.007	-.966	-.540	-.632	.171	.958	1.177	.007
6	30	-.786	.554	-.285	.000	.249	-.573	-.003	-.778	-.537	-.239	-.192	-.415	.410	.003
7	30	-.807	.577	-.271	.264	.770	-.275	-.002	-.791	-.541	-.264	-.205	.319	-.265	.002
8	30	-.810	.575	-.307	.237	.436	-.623	-.002	-.793	-.535	-.246	-.210	.331	-.259	.002
9	30	-.820	.586	-.329	.278	.547	-.225	-.004	-.892	-.590	-.618	-.054	-1.197	1.993	.004
10	30	-.835	.590	-.482	.283	-.514	-.223	-.014	-.995	-.551	-.789	.259	.070	2.346	.013
11	30	-.840	.593	-.490	.287	-.444	-.253	-.015	-1.049	-.557	-1.074	.537	-.172	2.664	.014
12	30	-.819	.580	-.310	.262	.540	-.272	-.009	-.841	-.553	-.392	-.219	-.775	.621	.006
13	30	-.772	.543	-.298	.027	.420	-.449	-.010	-.822	-.550	-.356	-.300	-.112	-.690	.010
14	30	-.849	.573	-.230	.316	.702	-.491	-.020	-.690	-.550	-.498	-.269	-.374	-.039	.018
15	30	-.830	.582	-.302	.308	-.937	-.550	-.017	-.612	-.531	-.260	-.305	.171	-.528	.015
16	30	-.809	.571	-.259	.276	.777	-.363	-.011	-.600	-.531	-.251	-.279	.236	-.446	.011
17	30	-.783	.553	-.275	.069	-.091	-1.124	-.018	-.797	-.527	-.217	-.244	-.351	.587	.016
18	30	-.809	.473	-.026	.369	-.494	-1.417	-.020	-.523	-.441	.000	-.522	-.298	1.364	.030
19	30	-.857	.385	.045	.616	.196	-1.760	-.022	-.850	-.367	-.003	-.616	.303	-.422	.015
20	30	-.865	.305	.077	.894	.003	7.967	-.044	-.679	-.313	.036	-.743	.323	-6.619	.029



## DOCUMENT SAMPLE CASE

K	TIME	Z	THTAS	THTASE	THTASK	THTASRB	CDPK	CLPK	AK	AKDGT	AKDDT
30	2.130	.179761	99.659	-100.719	160.973	-160.400	1.482451	.082228	.920127	.185818	-.218008
31	2.252	.189433	99.237	-100.259	157.039	-160.504	1.482451	.082228	.940059	.160799	-.217074
32	2.370	.199314	96.132	-97.657	161.772	-157.207	1.482451	.082228	.957458	.135340	-.216263
33	2.490	.209374	96.876	-97.057	161.547	-162.337	1.482451	.082228	.972106	.107499	-.215584
34	2.611	.219596	97.027	-98.262	157.237	-158.161	1.482451	.082228	.983824	.083337	-.215042
35	2.734	.229937	97.439	-98.465	155.730	-158.128	.865121	.181671	.992447	.050910	-.214645
36	2.859	.240368	95.993	-98.117	160.254	-158.151	.865121	.181671	.997857	.030307	-.214396
37	2.983	.250857	94.219	-97.397	162.514	-162.345	.865121	.181671	.999970	.003572	-.214299
38	3.108	.261369	93.144	-95.749	157.001	-162.683	.865121	.181671	1.000000	0.000000	0.000000
39	3.233	.271879	92.745	-94.339	166.593	-158.647	.865121	.181671	1.000000	0.000000	0.000000

N	K	X	Y	XDOT	YDOT	XDOT	YDOT	GAMMA	XB	YB	XDOTB	YDOTB	XDOTB	YDOTB	GAMMAB
1	40	-.899	.735	.057	.116	-.341	-.241	.016	-1.390	-.521	-.371	.326	1.162	-.367	-.016
2	40	-1.482	.274	.043	-.219	.997	.644	.047	-1.277	-.391	-.095	-.576	-.110	-.192	-.047
3	40	-1.176	.333	.110	.288	-.369	.377	.050	-1.263	-.393	-.094	-.076	-.106	-.211	-.050
4	40	-1.585	.162	.257	-.254	1.249	1.634	.051	-1.404	-.203	.109	.246	.902	-.069	-.051
5	40	-1.539	.322	-.140	-.452	1.419	.243	.052	-1.474	-.444	-.353	.443	1.304	-.182	-.052
6	40	-1.267	.729	-.097	-.262	-1.844	-.622	.052	-1.410	-.430	-.228	.191	.101	-.384	-.052
7	40	-1.265	.551	-.350	-.011	-.424	.612	.052	-1.250	-.737	-1.015	.647	-2.147	1.396	-.052
8	40	-1.031	.720	-.108	.272	.090	4.690	.052	-1.234	-.748	-.987	.135	-1.129	1.670	-.052
9	40	-1.218	.653	-.610	-.122	-.776	-1.257	.052	-1.312	-.539	-.422	.643	-.347	-.262	-.052
10	40	-.948	.586	-.053	.441	.058	.821	.053	-.985	-.524	-.328	-.383	-.971	-.743	-.047
11	40	-1.010	.732	.080	.139	1.590	-.381	.053	-1.163	-.761	-.959	.116	-2.424	3.341	-.047
12	40	-1.323	.402	-.101	-.026	.077	.417	.053	-1.279	-.383	-.095	-.074	-.086	-.180	-.048
13	40	-1.354	.407	-.123	-.011	-.137	.490	.057	-1.199	-.590	-.450	-.159	-1.111	.483	-.051
14	40	-1.109	.637	-.371	.169	-.076	-1.466	.061	-1.100	-.701	-.461	.070	-.618	3.639	-.055
15	40	-1.191	.710	-.896	-.170	-1.506	-1.522	.065	-1.181	-.565	-.422	-.176	-1.046	.522	-.058
16	40	-.984	.522	-.016	.461	-.132	-1.319	.069	-1.004	-.473	-.057	-.421	-.618	.492	-.061
17	40	-1.080	.243	.112	.546	-.335	.467	.073	-1.100	-.378	-.037	-.382	-.690	.176	-.065
18	40	-1.160	.477	-.116	.294	-.502	-.664	.078	-1.061	-.196	.188	-.565	-.840	-1.348	-.069
19	40	-1.135	.486	-.092	.291	-.475	-.682	.082	-1.199	-.207	.232	-.245	-.948	-.537	-.073
20	40	-1.107	.144	.341	.357	-.746	1.423	.087	-1.170	-.215	.225	-.232	-.401	-.592	-.076
21	40	-1.333	.251	.205	.008	.579	.598	.092	-1.362	-.209	.234	.045	.529	-.445	-.080
22	40	-1.253	.151	.461	.113	-.095	.754	.096	-1.267	-.099	.566	-.054	-.026	-.600	-.084
23	40	-1.469	.150	.411	-.076	.924	.676	.106	-1.478	-.130	.400	.164	1.359	-1.273	-.088
24	40	-1.746	.352	-.470	-.511	1.122	.153	.105	-1.455	-.320	-.071	.299	.914	-.288	-.092
25	40	-1.678	.241	-.088	-.394	1.141	.748	.109	-1.647	-.227	.038	.434	1.701	-.862	-.095
26	40	-1.345	.599	-.580	-.234	-.364	.196	.116	-1.621	-.353	-.335	.563	1.514	-.363	-.099
27	40	-1.461	.420	-.219	-.357	1.083	.782	.119	-1.404	-.587	-.071	.480	.805	.694	-.102
28	40	-1.548	.494	-.582	-.669	1.703	-.223	.122	-1.554	-.504	-.645	.645	1.397	.161	-.105
29	40	-1.440	.641	-.857	-.636	1.597	-.691	.125	-1.345	-.666	-.807	.306	.345	-.390	-.107
30	40	-1.358	.769	-1.180	-.414	.100	-1.465	.128	-1.356	-.761	-1.200	.464	.520	1.602	-.110
31	40	-.991	.785	-.410	.178	-1.322	.454	.132	-.976	-.708	-.102	.038	.395	-1.912	-.113
32	40	-1.077	.817	-.998	-.415	.391	-1.816	.133	-1.044	-.770	-.662	.301	1.323	.155	-.115
33	40	-.940	.855	-.868	-.068	-.039	.481	.134	-.937	-.815	-.750	.220	-.150	.244	-.115
34	40	-.849	.890	-.856	-.043	-.164	.551	.134	-.845	-.347	-.765	.161	.108	-.217	-.115
35	40	-.722	.905	-.774	-.149	.741	.313	.136	-.739	-.874	-.749	.191	.667	-.350	-.116
36	40	-.592	.937	-.870	-.204	1.422	.593	.137	-.624	-.911	-.844	.226	1.220	-.628	-.129
37	40	-.443	.980	-1.058	-.270	1.639	-.145	.137	-.476	-.960	-1.022	.306	.715	.069	-.130
38	40	-.274	1.013	-1.278	-.231	4.150	-1.312	.136	-.297	-1.005	-1.257	.275	3.997	1.271	-.130
39	40	-.041	1.022	-1.789	-.052	-14.315	-.417	.135	-.671	-1.020	-1.747	.103	-13.978	.822	-.130

N	K	XRT	YRT	XRDIT	YRDIT	XRDDT	YRDDT	GMART	XRB	YRB	XRDITB	YRDITB	XRDDTB	YRDDTB	GMARB
1	40	-.851	.529	-.037	-.069	-.814	-1.434	-.001	-.879	-.482	-.015	.021	.226	-.383	.001
2	40	-.851	.529	-.037	-.069	-.814	-1.434	-.002	-.909	-.600	-.047	-.018	.210	-.550	.002
3	40	-.851	.529	-.037	-.069	-.814	-1.434	-.002	-.899	-.044	.019	-.002	.026	-.511	.002
4	40	-1.566	.345	-.191	-.506	1.400	.807	-.005	-1.530	-.226	.096	.392	1.593	-.204	.005
5	40	-1.743	.334	-.468	-.519	1.279	.682	-.007	-1.484	-.204	.110	.243	.923	-.082	.007
6	40	-.971	.752	-.171	.290	-.986	1.170	-.003	-1.065	-.728	-.582	.127	-.636	1.433	.003
7	40	-1.259	.789	-1.246	-.228	-1.740	-1.087	-.002	-1.076	-.691	-.343	.032	1.431	-2.255	.002
8	40	-1.282	.736	-1.010	-.204	-2.064	-.687	-.002	-1.118	-.745	-.597	.143	.456	.647	.002
9	40	-1.299	.539	-.294	-.010	-.023	.538	-.004	-1.507	-.135	.443	.181	1.431	-1.034	.004
10	40	-1.554	.334	-.163	-.476	1.400	.566	-.014	-1.351	-.200	.248	.059	.533	-.441	.013
11	40	-1.653	.369	-.429	-.456	.949	-.059	-.015	-1.177	-.088	.549	-.222	-.953	-.823	.014
12	40	-1.274	.546	-.336	-.007	-.328	.164	-.009	-1.635	-.352	-.317	.571	1.633	-.385	.006
13	40	-.856	.721	-.028	-.145	-1.613	-1.091	-.010	-1.562	-.409	-.305	.537	1.499	-.391	.010
14	40	-1.652	.368	-.426	-.456	.951	-.059	-.020	-1.464	-.307	-.047	.279	.901	-.374	.018
15	40	-1.467	.335	-.019	-.263	1.263	.519	-.017	-1.312	-.046	-.763	.221	-.190	.511	.015
16	40	-1.286	.732	-.092	-.200	-2.042	-.646	-.011	-1.245	-.806	-1.367	.222	-1.968	2.545	.011
17	40	-1.183	.735	-.980	-.266	.113	.047	-.018	-1.083	-.693	-.381	.046	1.386	-2.057	.016
18	40	-.909	.732	-.035	.237	-1.369	-.665	-.020	-.925	-.589	-.061	-.034	.120	-.591	.030
19	40	-.896	.664	-.186	.073	-1.314	.090	-.022	-1.212	-.782	-1.139	.150	-.796	1.837	.019
20	40	-1.270	.749	-1.057	-.227	-1.472	-1.457	-.044	-1.012	-.696	-.178	-.037	-.466	.404	.029
21	40	-.902	.683	-.038	.143	-.249	.303	-.039	-1.144	-.760	-.896	.182	-1.615	1.380	.037
22	40	-.925	.719	.006	.233	-.349	-.274	-.044	-1.077	-.707	-.350	.136	.685	1.522	.034
23	40	-.978	.715	.010	.541	.749	1.684	-.036	-1.018	-.663	-.059	.116	1.502	2.726	.026
24	40	-.992	.678	.052	.512	2.271	.781	-.029	-.596	-.641	-.034	-.039	.880	2.050	.019
25	40	-.949	.628	-.206	.384	-.634	.551	-.030	-.988	-.577	-.330	-.248	-.046	-.285	.031
26	40	-.918	.535	-.023	.417	.504	2.414	-.026	-.936	-.528	-.202	-.167	-.537	-.229	.021
27	40	-.944	.535	.037	.264	.639	-1.575	-.049	-.935	-.491	-.065	-.321	-.103	-.815	.037
28	40	-.901	.520	.029	.333	-.065	.277	-.034	-.918	-.457	.022	-.221	-1.193	2.630	.033
29	40	-.967	.315	.183	.611	.280	-.261	-.028	-.917	-.440	.039	-.301	-1.343	2.180	.023
30	40	-.988	.234	.159	.741	1.275	5.932	-.036	-.990	-.222	.135	-.717	1.077	-5.735	.033

T= 3.3582 Z= .7924 PRESSURE DISTRIBUTION AK= 1.0000 AKOUT= 0.0000 THETAS= 92.28

DEG	PHIVT	PHIPT	Z(PHIT)	-PSIKSQD	CPK	CP3D	UTAN
0.00	.014622	0.000000	.029243	-.000985	1.028259	.257065	.031384
10.00	.016034	0.000000	.032063	-.140031	.892037	.223003	.374208
20.00	.017574	0.000000	.035147	-.498438	.536710	.134177	.706001
30.00	.019239	0.000000	.038479	-1.032590	.005888	.001472	1.016164
40.00	.021001	0.000000	.042002	-1.675993	-.633992	-.158498	1.294602
50.00	.022757	0.000000	.045514	-2.346744	-1.301230	-.325308	1.531909
60.00	.024219	0.000000	.048433	-2.956503	-1.908065	-.477016	1.719448
65.00	.024621	0.000000	.049242	-3.211400	-2.162158	-.540540	1.792038
70.00	.024542	0.000000	.049084	-3.419552	-2.370468	-.592617	1.849203
75.00	.023568	0.000000	.047135	-3.571855	-2.524720	-.631180	1.889935
80.00	.020852	0.000000	.041703	-3.660047	-2.618343	-.654586	1.913125
85.00	.014469	0.000000	.028937	-3.676595	-2.647657	-.661914	1.917445
90.00	-.000785	0.000000	-.001570	-3.614303	-2.615873	-.653968	1.901132
95.00	-.043494	0.000000	-.086988	-3.465412	-2.552400	-.638100	1.861562
100.00	-.222605	0.000000	-.445210	-3.219615	-2.664824	-.666206	1.794328
105.00	-.067791	0.000000	-.135583	-2.659483	-1.995066	-.498766	1.691000
110.00	-.585832	0.000000	-1.171664	-2.349254	-2.520918	-.630230	1.532728
115.00	-.840246	0.000000	-1.680491	-1.613736	-2.294227	-.573557	1.270329
120.00	-.689635	0.000000	-1.379270	-.667937	-1.047207	-.261302	.817274
125.00	-.738240	0.000000	-1.476481	-.232858	-.709339	-.177335	.482553
130.00	-.737230	0.000000	-1.474460	-.114969	-.589428	-.147357	.339071
135.00	-.764570	0.000000	-1.529141	-.061172	-.590312	-.147578	.247329
140.00	-.796072	0.000000	-1.592145	-.041738	-.633883	-.158471	.204300
145.00	-.800422	0.000000	-1.600845	-.008963	-.609807	-.152452	.094671
150.00	-.763170	0.000000	-1.526341	-.022436	-.548776	-.137194	-.149786
155.00	-.733528	0.000000	-1.467056	-.194371	-.661427	-.165357	-.440875
160.00	-.725126	0.000000	-1.450252	-.370623	-.820875	-.205219	-.608788
165.00	-.670675	0.000000	-1.341350	-.495682	-.837032	-.209258	-.704047
170.00	-.609151	0.000000	-1.218302	-.479144	-.697446	-.174361	-.692202
175.00	-.546706	0.000000	-1.093413	-.205467	-.298880	-.074720	-.453285
180.00	-.560671	0.000000	-1.121342	-.02421	-.123763	-.030941	-.049207
185.00	-.552606	0.000000	-1.105212	-.110504	-.215716	-.053929	.332422
190.00	-.493216	0.000000	-.986433	-.536223	-.522655	-.130664	.732272
195.00	-.611910	0.000000	-1.223820	-.429234	-.653055	-.163264	.655160
200.00	-.655799	0.000000	-1.311598	-.258276	-.569874	-.142468	.508208
205.00	-.632316	0.000000	-1.264832	-.110563	-.375196	-.093799	.332510
210.00	-.714704	0.000000	-1.427407	-.013830	-.443237	-.110809	-.117602
215.00	-.713446	0.000000	-1.426892	-.014062	-.440954	-.110238	-.118583

220.00	-.727013	0.000000	-1.454025	-.022230	-.476255	-.119084	-.149094
225.00	-.732153	0.000000	-1.464305	-.059036	-.523341	-.130835	-.242973
230.00	-.731795	0.000000	-1.463570	-.135752	-.595322	-.149030	-.368445
235.00	-.729630	0.000000	-1.459261	-.200245	-.759506	-.189876	-.547946
240.00	-.693365	0.000000	-1.386730	-1.019810	-1.406540	-.351635	-1.009856
245.00	-.727196	0.000000	-1.454391	-1.869366	-2.323757	-.580939	-1.367248
250.00	-.609108	0.000000	-1.218216	-2.458845	-2.677062	-.669265	-1.568071
255.00	-.869264	0.000000	-1.738528	-2.875405	-3.613933	-.903483	-1.695782
260.00	-.160807	0.000000	-.321614	-3.172714	-2.494328	-.623582	-1.761211
265.00	-.053253	0.000000	-.106506	-3.373826	-2.480332	-.620083	-1.836790
270.00	-.022250	0.000000	-.044499	-3.490037	-2.534536	-.633634	-1.868164
275.00	-.009215	0.000000	-.018431	-3.528399	-2.546830	-.636707	-1.878403
280.00	-.002534	0.000000	-.005068	-3.494759	-2.499827	-.624957	-1.869428
285.00	.001342	0.000000	.002685	-3.395087	-2.392402	-.598101	-1.842578
290.00	.003804	0.000000	.007607	-3.236073	-2.228466	-.557116	-1.798909
295.00	.005487	0.000000	.013974	-3.025359	-2.014385	-.503596	-1.739350
300.00	.006718	0.000000	.013436	-2.771568	-1.758132	-.439533	-1.664803
310.00	.008468	0.000000	.016935	-2.173501	-1.156565	-.289141	-1.474280
320.00	.009784	0.000000	.019569	-1.524971	-.505482	-.126351	-1.234897
330.00	.010956	0.000000	.021913	-.912086	.109827	.027457	-.955832
340.00	.012114	0.000000	.024227	-.414651	.609576	.152394	-.643934
350.00	.013323	0.000000	.026646	-.097102	.929544	.232386	-.311611
360.00	.014622	0.000000	.029243	-.600985	1.028259	.257065	.031384

## DOCUMENT SAMPLE CASE

K	TIME	Z	THFTAS	THFTASB	THFTASR	THFTASRB	CDPK	CLPK	AK	AKDUT	AKUDT
40	3.358	.282390	97.284	-93.967	165.852	-167.360	.552244	-.010932	1.000000	0.000000	0.000000

Z	CD	CL	THETAS	THETASB
.026818	.200238	0.000000	112.260719	-112.260719
.047840	.300531	0.000000	108.586482	-108.586482
.069859	.381502	.003238	106.207993	-106.441760
.090534	.478100	.012845	104.467467	-105.015890
.135297	.439982	.020436	101.783390	-102.573305
.179761	.370613	.020557	98.658706	-100.718952
.229937	.216280	.045418	97.437931	-98.464543
.282390	.138061	-.002645	92.283364	-93.966950
CN	CY	CSM	CSM	
1.085350	.058474	-.157943	-.011062	

## 5.0 OPERATION

The following example shows a deck setup for the execution of DIVORCE. The cards designated by a plus sign (+) are those which are optional depending upon the existence of special inputs. The job and any accounting cards are not shown. The setup shown assumes the total use of disk files. If tapes are to be used the proper control cards must be substituted. Also the input data is assumed to be on cards rather than a disk file.

ATTACH, DIVORCE.	Binary version of the program
+REQUEST,TAPE5,*PF.	If RITEOUT=1
+REQUEST,TAPE6,*PF.	If KLOUT#0
+REQUEST,TAPE7,*PF.	If KPRES#0
+ATTACH,TAPE4,RESTART.	If READIN=1
ATTACH,RDALIB.	Vector routine library
LIBRARY,RDALIB.	
LDSET,PRESET=ZERØ,MAP=_____.	Set core to zero and map option
DIVORCE.	Execute.
+CATALØG,TAPE5,NAME.	
+CATALØG,TAPE6,NAME.	
+CATALØG,TAPE7,NAME.	
EØS.	End of section
TITLE CARD.	Case title card
\$ENGAGE	NAMELIST title card
.	Data
.	
\$END	End of case card
EØI	End of information

If KVEC is large enough that the vector routines are not being used, the RDALIB cards may be left out, although load errors (unsatisfied externals) will be generated. These are generally non-fatal. Core should be set ot zero for safety since the program was written on a system that did this automatically.

## 6.0 REFERENCES

- 1 Stratford, B. S., "The Prediction of Separation of the Turbulent Boundary Layer," Ingenieur-Archivum, Vol. 38, 1969, pp. 97-106.
- 2 Jorgensen, Leland J., "Prediction of Static Aerodynamic characteristics for Slender Bodies Alone and With Lifting Surfaces to Very High Angles of Attack," NASA TR R-474, Sept. 1977.